The Victorian Naturalist

Vol. 105, No. 1

January/February 1988

Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

$3·50

The Field Naturalists Club of Victoria

CALENDAR OF EVENTS, JANUARY – JUNE 1988

JANUARY

Wed	20	**Microscopical Group.** Members' Night. Bring your own exhibit.

FEBRUARY

Mon	1	**Council Meeting.** (NB. 1 week later than usual due to Australia Day holiday.)
Tue	2	**Mammal Survey Group.** "The Lifestyle and Veneral Diseases of Koalas." Dr. Kath Handasyde.
Wed	3	**Geology Group.** Members' Night.
Sun	7	**General Excursion.** Insects and General – Mt Donna Buang. Leader: Peter Carwardine.
Mon	8	**General Meeting.** Wildlife of the Melbourne Metropolitan Area." Cam Beardsell.
Thu	11	**Botany Group.** "Food Plants of Butterflies & Moths" John Reid.
Mon	15	**Council Meeting** to discuss budget.
Wed	17	**Microscopical Group.** "Making Your Own Microscope." For beginners.
Thu	18	**Day Group.** Garden City & West Gate Parks. Port Melbourne. Leader: Dan McInnes 211 2427.
Sat	27	**Botany Excursion.** Food Plants of Butterflies & Moths –Warrandyte State Park. Leader: John Reid.
Mon	29	**Council Meeting.**

MARCH

Tue 1 **Mammal Survey Group.**

Wed 2 **Geology Group.** "Graptolites." Norman Plever.

Mon 7 **General Meeting.** "Geological Features of the National Estate." Robert King. (NB. 1 week earlier than usual due to Labour Day holiday.)

Sun 6 **Geology Group.** Excursion to Club property – Kinglake.

Thu 10 **Botany Group.** "Speaking of Hakeas." Hazel Blackney.

Sat 12 – Mon 14 **Mammal Survey Group excursion.** Central Highlands.

Sat 12 – Mon 14 **Victorian Field Naturalists Clubs Association gathering** – Princetown area (near Port Campbell). Hosted by Timboon Club.

Wed 16 **Microscopical Group.** "History of Microscopes." Display of old microscopes.

Thu 17 **Day Group.** Ferntree Gully Park. Leader: Marge Wilson 836 3521.

Sat 26 **Botany Excursion.** Seaweeds – Black Rock. Leader: Hilary Weatherhead.

Mon 28 **Council Meeting.**

APRIL

Fri 1 – Tue 5 **Mammal Survey Group excursion.** Mallee.

Wed 6 **Geology Group.** "Catastrophes, Extinctions and Evolution." Max Campbell.

Sat 9 or Sun 10 **General Excursion.**

Mon 11 **General Meeting.** "A Journey Through Southern Africa." Barbara Hadley.

Tue 12 **Mammal Survey Group.** "Captive Animal Management in Australasian Zoos." Peter Myroniuk.

Thu 14 **Botany Group.** "Eucalypts and their Environment." Pat Carolan.

Wed 20 **Microscopical Group.** "Design & Care of Modern Microscopes."

Thu 21 **Day Group.** Black Rock. Leader: Dan McInnes 211 2427.

Sat 23 **Botany Excursion.** Eucalypts.

Mon 25 **Council Meeting.**

MAY

Sun	1	**General Excursion.** Knox Regeneration Project with Andrew Paget.
Tue	3	**Mammal Survey Group.** "Vegetation Surveys, Diet Analysis and Habit Delimitation." David Cheal.
Wed	4	**Geology Group.** "Gold and the Pacific Rim." Graeme Love.
Mon	9	**Annual General Meeting.** President's Address.
Thu	12	**Botany Group.** "Fungi." Tom May.
Wed	18	**Microscopical Group.** "Illuminating the Object. Setting up Suitable Lighting."
Thu	19	**Day Group.** Rockbeare Park & Pottery. Leader: Joan Miller 836 2681.
Sat	28	**Botany Excursion.** Fungi.
Mon	30	**Council Meeting.**

JUNE

Wed	1	**Geology Group.** "Clay Resources of the Ballarat Region." Peter Atkinson.
Sun	5	**General Excursion.** Seawinds.
Mon	6	**General Meeting.** Speaker: Dr Jim Willis. (NB. 1 week earlier than usual due to Queen's Birthday holiday.)
Tue	7	**Mammal Survey Group.** Members' Night.
Thu	9	**Botany Group.** "Kashmir – In Search of Wildflowers." Hilary Weatherhead.
Sat 11 – Mon 13		**Mammal Survey Group excursion.** Tallarook forest.
Wed	15	**Microscopical Group.** "Preparation of Objects to be Examined Under the Microscope."
Thu	16	**Day Group.** Meteorological Centre, Spring St., Leader: Andy Blackburn 379 8960.
Sat	25	**Botany Excursion.** Butterfly House – Melbourne Zoological Gardens.
Mon	27	**Council Meeting.**

NB. For further details of events, see current *Victorian Naturalist.*

CONTACTS

PRESIDENT	
Dr Jack Douglas	277 4804 (AH)
VICE PRESIDENT	
Mr Graeme Love	697 5109 (BH)
EXCURSIONS & GENERAL INFORMATION	
Miss Marie Allender	527 2749
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Mr Dan McInnes	211 2427
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Miss Margaret Potter	29 2779
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Mr Julian Grusovin	211 4997
MICROSCOPICAL GROUP	
Mrs Elsie Graham	469 2509
HAWTHORN JUNIOR F.N.C.	
Mr Gerard Marantelli	347 3824

MEETING TIMES & VENUES

* General meetings start at 8 pm. See current *Victorian Naturalist* for venue.

* All other meetings, except Day Group and Hawthorn Junior F.N.C. start at 8pm and are at the Astronomer's Residence, Birdwood Ave., South Yarra.

FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria Street, Melbourne.

Monday, 7th March, 8 p.m.

Robert King "Geological Features of the National Estate". (N.B.: Meeting is a week earlier due to Labor Day Holiday.)

Monday, 11th April, 8.00 p.m.

Barbara Hadley "A Journey Through Southern Africa".

FNCV EXCURSIONS

Friday, 11th-14th March to Princetown, Port Campbell area. This is the Annual Meeting of the Victorian Field Naturalists Association and will be hosted by the Timboon Field Naturalists Club.

Accommodation has been booked at "Kangaroobie", Princetown which will be multi-share, mostly bottom bunks. Bed linen and towels should be taken – the beds have doonas.

All meals are provided from supper Friday evening to a packed lunch on Monday.

Day excursions on Saturday and Sunday and evening meetings. Return home on Monday.

The coach will leave the Gas & Fuel building at 10.30 a.m. on Friday, 11th and members should bring 2 picnic meals. Cost for the weekend – accommodation, meals and coach $155, less if numbers warrant it.

Bookings and payments to Marie Allender until Thursday, 25th February, phone 527 2749. After that date to Dr. Elizabeth Turner, phone 861 8611. Please book as soon as possible.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Avenue, South Yarra (a few metres nearer the Shrine than the Herbarium) at 8.00 p.m.

Botany Group – Second Thursday

Thursday, 10th March. "Speaking of Hakeas". Hazel Blackney.

Thursday, 14th April. "Eucalyptus and their Environment." Pat Carolan.

Day Group – Third Thursday

Thursday, 17th March. Ferntree Gully National Park. Train leaves Flinders Street at 10.15 a.m. Or meet at Ferntree Gully station at 11.30 a.m. Leader: Marge Wilson 836 3521.

Thursday, 21st April. Black Rock. (Possible change of this excursion – check with leader Dan McInnes 211 2427.)

Microscopical Group – Third Wednesday

Wednesday, 16th March. History of Microscopes. History of old Microscopes.

Wednesday, 20th April. Design and Care of Modern Microscopes.

Mammal Survey Group – First Tuesday

Tuesday, 1st March.

Tuesday, 12th April. "Captive Animal Management in Australasian Zoos." Peter Myroniuk.

Geology Group – First Wednesday

Wednesday, 2nd March. "Graptolites." Norman Plever.

Wednesday, 6th April. "Catastrophes, Extinctions and Evolution." Max Campbell.

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursions

Botany Group – Fourth Saturday

Saturday, 27th February. Food Plants of Butterflies and Moths – Warrandyte State Park. Leader. John Reid.

Saturday, 26th March. Seaweeds – Black Rock. Leader: Hilary Weatherhead.

Saturday, 23rd April. Eucalypts.

Geology Group

Sunday, 6th March. Club property – Kinglake.

Mammal Survey Group

Saturday, 12th – Monday, 14th March. Central Highlands.

The Victorian Naturalist

Volume 105, Number 1

January / February, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Illustration: The Lesser Bilby (Oldfield Thomas 1888) see page 208

Suspected Bush Rat Damage to Planted Spotted Gum in East Gippsland

By Peter C. Fagg*

Introduction

This report describes some observations of substantial damage apparently caused by the bush rat (*Rattus fuscipes*) eating the roots of spotted gum (*Eucalyptus maculata*) in a young, multi-species experimental plantation in East Gippsland, Victoria. This appears to be an isolated record of bush rats including tree roots in their omnivorous diets.

Description of the Plantation Site

The 4 ha experimental plantation, located adjacent to the Orbost-Buchan Road, 12 km west of Orbost, was established over the period 1971-73 to test the tolerance of 23 *Eucalyptus* species, two *Pinus* species, and one *Angophora* species to the die-back-causing cinnamon fungus (*Phytophthora cinnamomi*). The site previously carried and is presently surrounded by 25-30 m tall native forest exhibiting moderate to severe crown dieback. The predominant tree species are silvertop (*E. sieberi*), red stringybark (*E. macrorhyncha*), white stringybark (*E. globoidea*), and yertchuk (*E. consideniana*), and the understorey includes myrtle wattle (*Acacia myrtifolia*), smooth parrot-pea (*Dillwynia glaberrima*), thatch saw-sedge (*Gahnia radula*) and smaller herbs and grasses.

The soil has a duplex profile, consisting of a shallow, greyish, poorly-structured, sandy clay-loam over red-mottled clay at 30-40 cm depth. Heavy rain causes rapid water-logging of the soil, yet it sets hard during dry periods. The site was initially cleared of all vegetation and debris, cultivated before planting, and was enclosed by an 80 cm high, 4 cm mesh, wire-netting fence, whose lower edge was buried 10 cm below ground level to exclude rabbits, wallabies and kangaroos. By 1979, approximately 8 years after establishment, a relatively dense ground cover (predominantly thatch saw-sedge) was present.

The 1971 and 1972 plantings were in 6 m x 6 m plots, each containing 25 trees of the one species, and replicated twice (in adjacent blocks) – with and without NPK fertiliser. Spotted gum (50 trees) was included in the 1971 plantings, and in further plantings in 1973 of two fertilised buffer rows (54 trees) located adjacent to larger plots of other species. A total of about 5000 trees of all species were planted over the 1971-73 period.

By July 1979 the 8-year-old fertilised spotted gum had achieved a mean height and diameter of 4.0 m and 4.8 cm respectively, compared with the unfertilised trees which were 2.6 m and 2.4 cm. By 1980, the 1973 spotted gum plantings had grown to similar (fertilised) dimensions.

Assessments and Observations

All species in the 1971 and 1972 plantings were assessed for mortality in August 1978 and again in September 1979. The 1973 plantings were assessed in May 1980.

The 1979 assessment showed a sharp increase in mortality of the 8-year-old unfertilised spotted gum: 40% (10 out of the 25 trees) were dead, compared with only 8% (2 out of 25) in August 1978. Close examination of the plot revealed burrows up to 15 cm deep, abutting and sometimes encircling the rootstocks (Fig. 1). The bark and wood of the lateral roots and taproots had been gnawed away to a varying extent (Figs. 2 and 3). All dead trees had been severely damaged in this way, and no coppice growth had occurred. All other species in the plantation were undamaged.

Callus growth around the edges of some injured rootstocks (Fig. 3) indicated that several of the trees had been attacked, but not killed, 6-12 months previously. However, additional consumption of rootwood during the 1979 winter is believed to have re-

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378 Cotham Road, Kew 3101.

Fig. 1. Eight-year-old spotted gum with a burrow, suspected to be that of a bush rat, around the base, in September 1979. The pocket knife is 15 cm long.

sulted in the death of several of these trees. Rootstocks of a few stems had been completely consumed, and these trees had subsequently fallen over or stood at acute angles in the burrow holes. Much less severe damage was observed in the fertilised spotted gum plot.

The 1980 assessment of the 1973 spotted gums showed that 6% had been killed, and a further 17% had been damaged as a result of consumption of the bark and wood of roots. In general, the bases of the undamaged trees were relatively exposed, in contrast to those damaged which had the lower 10-20 cm covered with thatch saw-sedge or other vegetation.

Over three nights in November 1979, an attempt was made to trap the animal(s) responsible. One wire mesh cage baited with mixture of peanut butter, honey and rolled oats, was positioned in the plot that contained the worst-affected trees. No animal was caught – a result which was not surprising in view of the lack of evidence of recent animal activity. An inspection of all planted

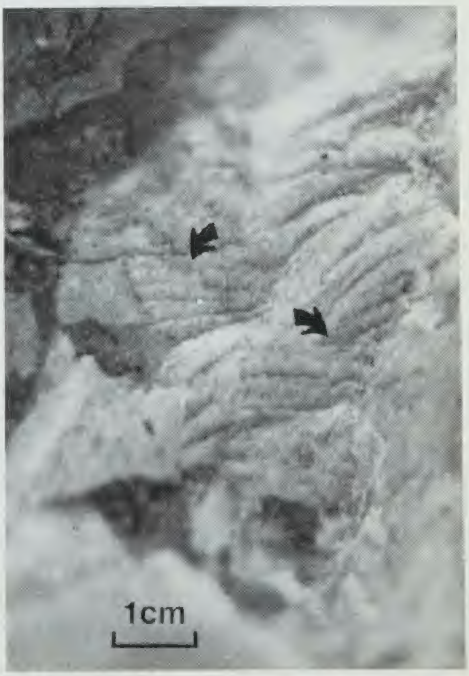

Fig. 2. Teeth marks on the rootstock of a spotted gum tree attacked and killed in 1979.

species in April 1983 and July 1985 revealed no recent damage or additional mortality of trees, though a few active burrows that were not near tree bases were discovered (Fig. 4).

Discussion

From an examination of the teeth marks on the gnawed wood (Fig. 2) and the type of fur adhering to kino exudations, combined with the nature of the burrows, it was concluded that the animal causing the damage was almost certainly the bush rat (*Rattus fuscipes*) (Macfarlane*, pers. comm.).

This native, ground-dwelling mammal is common in East Gippsland, and in other coastal or sub-coastal forest from near Terang in western Victoria to Rockhampton in Queensland (Hyett and Shaw 1980, Lunney 1983). A bush rat was, in fact, trapped adjacent to the plantation area in July 1975 (Fagg 1986). Because this animal constructs burrows for shelter and nesting (Warneke 1971), the burrows were supportive of the above diagnosis, though in this case, the purpose of the burrowing around the tree bases was probably for gaining access to the palatable root wood rather than for seeking shelter. In the absence of distinct runways it was considered unlikely that the animal was the swamp rat (*Rattus lutreolus*), which has a similar distribution and habitat as the bush rat. The observed severe damage to trees whose bases were covered by thatch saw-sedge is consistent with Warneke's (1971) observation that bush rats prefer dense vegetation for protection.

The reason why spotted gum was the only species attacked out of 26 tree species is not clear. The choice of tree species by the bush rat was not likely to have been random, because the attacks were found on three separate plots of spotted gum at least 30 m apart, and each surrounded by plots of other tree species. This suggests that the bark and root wood of the young spotted gum was more palatable than that of any of the other 25 species. Spotted gum sapwood (compared with other eucalypts) is known to have relatively large amounts of starch (Tamblyn 1978) which may have attracted the bush rats. The less severe damage in the fertilised 1971 plot was probably due to its greater distance from the edge of the native forest and also its relative lack of thatch saw-sedge understorey. No tree mortality was attributable to the cinnamon fungus – an expected result, because spotted gum is tolerant of this disease and invariably remains healthy in infected areas (Marks *et al.* 1973).

Fig. 3. Damaged rootstock and lower trunk of a spotted gum tree strongly suspected to have been killed by bush rats. Note the callus growth over wounds caused by previous attack in 1978.

* M. A. Macfarlane, Wildlife Research Officer, formerly of the State Forests and Lands Service, Mountain Forest Research Station, Sherbrooke, Vic.

McIlroy's (1978) review of damage to native trees by animals contains no instances of ground-dwelling native animals causing severe damage to indigenous trees. In forest at Cape Liptrap, Watts and Braithwaite (1978) only once recorded 'root' material in faecal pellets of bush rats, then only comprising 3% by volume. Their more extensive study of swamp rats' diet also showed negligible 'root' material. Cheal (1987) reported that non-woody, non-fibrous root material was a regular dietary component of the bush rat at Walkerville in winter, but no woody tissue was reported either for it or the co-existent swamp rat.

In other areas, bush rats have caused substantial damage to young trees of the introduced radiata pine (*Pinus radiata*). For example, at Loch Valley in Central Gippsland, bush rats have been observed to feed on the cambial tissue of the lower trunks of radiata pine during late winter following summers in which the rats have been unable to build up their fat reserves (Warneke 1971). McNally (1955), who examined several instances of damage by bush rats to radiata pine (at or above ground level), suggested that its cambial tissue offers a concentrated source of assimilable starches and sugars, and that the cellulose component of the phloem may also be attractive as a food source for the bush rat. In a survey of a 6-year-old radiata pine plantation at Mt. Macedon in West-Central Victoria during 1954, McNally (1955) found that bush rats damaged 80% of trees, killing 15% of these. Interestingly, no damage was observed on young radiata pine growing near spotted gum at the Orbost site.

Fig. 4. A burrow entrance of 6-8 cm diameter, discovered in July 1985 in the plantation. Note the thatch saw-sedge that surrounds the entrance, which is typical of a bush rat's burrow.

Although late winter is the time of year when the populations of bush rats are at their lowest level (Warneke 1971), the food intake per capita reaches a peak during this period (Lunney 1983), and rats may then be forced to utilise plant tissues that are avoided at other times of the year (Warneke 1971).

In relation to the 1979 damage, examination of rainfall records from the site showed well below-average rainfall for two periods, October-December 1977, and January-February 1979. The quantities of palatable herbs and litter-dwelling insects available to bush rats during these abnormally dry periods would have been very much reduced compared with those normally available during these periods, and the ability of the rats to build up their fat reserves prior to winter could therefore have been impaired. This probably caused the bush rats to attack the bark and wood of spotted gum in the winters of 1978 and 1979 to supplement their diet. The restriction on the attack to a limited period suggests that this food source was only marginally palatable, so that the rats reverted to their normal diet as soon as it became available.

Acknowledgements

I thank the following officers of the Department of Conservation, Forests and Lands for their assistance with this report: Mr. P. Geary, Mr. R. Warneke, Mr. M. Macfarlane, Mr. H. Stewart, Mr. F. Neumann, Dr. D. Flinn, and Mr. R. McKimm.

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Erratum

On two occasions we have published a photograph purporting to be of Alec H. Chisholm; in Vic. Nat. v. 101 p. 18 1984, and in Houghton, S. *The history of the Australian Natural History Medallion,* 1987. It has now been established that this is a mistake, and we publish below an autheticated photograph of Alec Chisholm. We are indebted to Mrs. Tess Kloot for this photograph which was taken in 1976 by her late husband Bern Kloot.

Alec H. Chisholm; The first (1940) Australian Natural History Medallionist.

The Status of the Trout Cod, *Maccullochella macquariensis* in the Australian Capital Territory

By Mark Lintermans, Kruno Kukolic, Terry Rutzou*

Introduction

The trout cod was originally described by Cuvier and Valenciennes in 1829 and is very similar to the closely related Murray Cod *M. peeli*. There is considerable overlap in the distribution of these species in much of south-eastern Australia which has caused much confusion and doubt as to whether they were separate species. In 1972 a taxonomic study (Berra and Weatherley 1972) clearly established that there were two distinct species with the rarer trout cod now considered to be endangered (Cadwallader and Gooley 1984; Merrick and Schmida 1984; Fulton 1987).

The distribution of trout cod has been greatly reduced in recent years (Cadwallader and Gooley 1984). Information on its historical occurrence is limited because of the confusion with Murray cod but it is known that it was once widespread in the Murray-Darling system in the cooler upper reaches (Cadwallader and Backhouse 1983). Trout cod were also introduced into Lake Sambell (Beechworth, Victoria) in 1928 and could be caught there readily until 1970 when an unexplained fish kill occurred.

The species has been recorded recently from the Mitta Mitta River (Victoria), the upper Murray River near Tintaldra, Cataract Dam on the Nepean River (New South Wales) and Seven Creeks (Victoria) (Cadwallader and Backhouse 1983), as well as the Macquarie River and Glenbawn Dam on the Hunter River (Merrick and Schmida 1984). Recent literature lists the Murrumbidgee River near Tharwa in the Australian Capital Territory as containing a population of Trout Cod (Shorthouse 1984; Merrick and Schmida 1984; Cadwallader and Backhouse 1983; Llewellyn and Macdonald 1980). Merrick and Schmida (1984) also list the Molonglo River downstream of Canberra as containing trout cod. However this may be an error as there is no evidence of the species ever being caught at this locality. The most recent reliable report of trout cod in the ACT was in the mid to late 1970's when several individuals were taken by an angler in the Murrumbidgee River. A further report of trout cod being caught in the Murrumbidgee River in 1984 is unconfirmed.

Anecdotal information records the trout cod in the ACT as occurring in the Murrumbidgee River from Angle Crossing to Kambah Pool with the more recent records coming from the vicinity of a gorge approximately 1.5 km downstream of Angle Crossing (Figure 1). Berra (1974) records that he collected specimens in the Murrumbidgee River but doesn't give a precise location or date of collection. Bell (in Berra 1974) also collected a specimen 164 mm in length in 1970 which is lodged with the Australian Museum in Sydney. The locality was given as "Murrumbidgee River near Canberra". During routine river monitoring since 1979, very little information on trout cod had been obtained. Due to the lack of current information on the ACT population a survey was conducted to determine whether in fact the trout cod still exists in the ACT.

Methods

Between November 1984 and March 1986 a number of sites on the Murrumbidgee River were sampled using a variety of techniques including drum nets, gill nets and angling with deep-diving lures. Field work was confined to the period from mid-spring through to late autumn because at other times water level and flow velocity were too high to allow access and/or efficient sampling of the river.

Gill netting was the major sampling technique used during both the survey and routine monitoring. Up to 14 gill nets were used at each site with mesh sizes varying between

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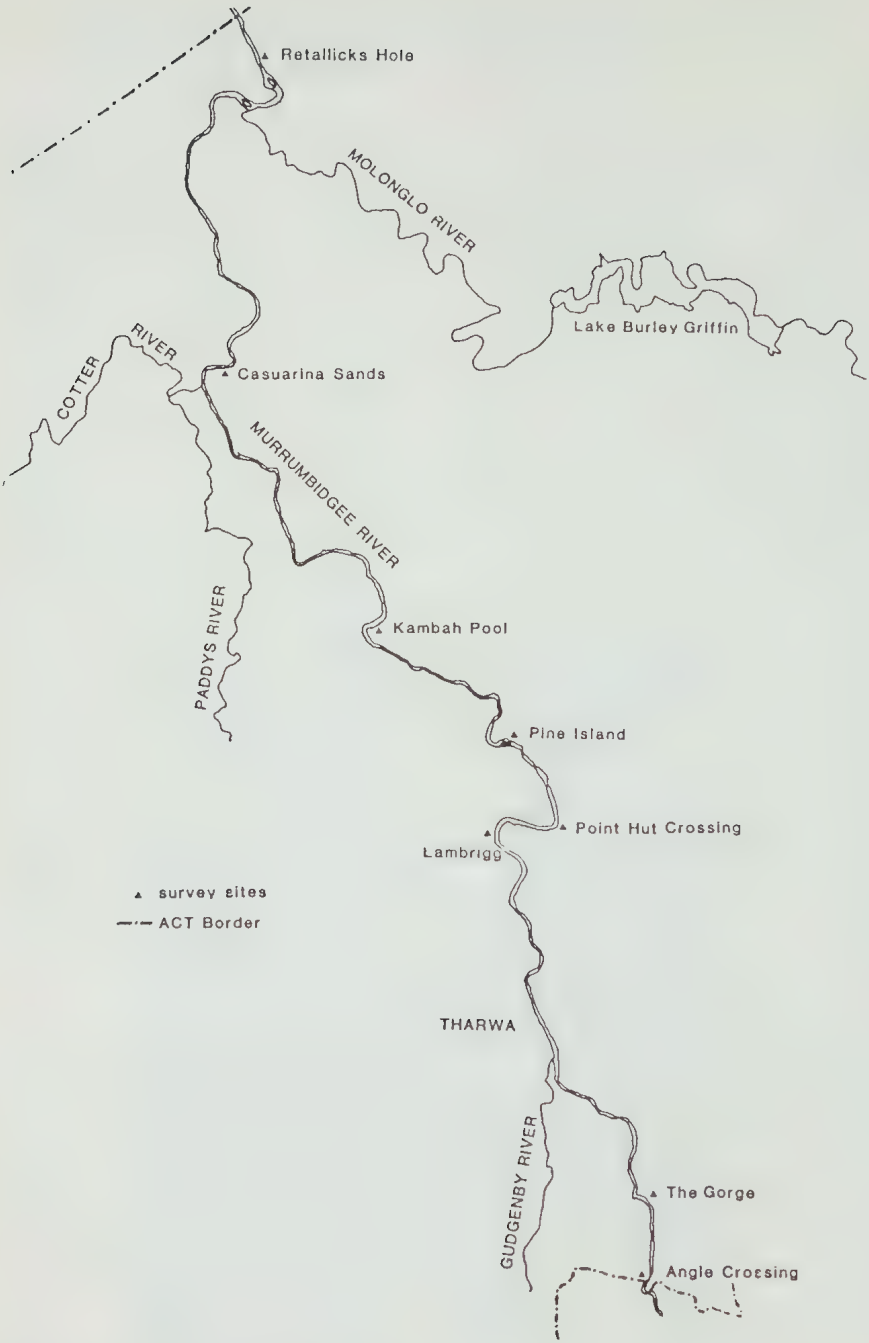

Figure 1. The Murrumbidgee River in the ACT showing sites surveyed.

25 and 300 mm. Nets were 45 m in length un-strung and approximately 30 m in length when strung on the float line. The 25-100 mm nets were 100 meshes deep with the 125-300 mm nets being 33 meshes deep. The nets were unweighted (to reduce platypus mortality) and were broken into three or four groups, set in a herringbone fashion off the bank of the river, with one end attached as close to the bank as possible. The nets were set during the afternoon and cleared the next morning. Drum nets (900 mm diameter) and set lines were used at several sites as well as angling. The survey for the trout cod concentrated on that section of the Murrumbidgee River where trout cod had been recorded in the recent past, namely between Angle Crossing and Point Hut Crossing with most attention being directed to the river section between Angle Crossing and Tharwa.

Results and Discussions

In 28 sampling trips of the Murrumbidgee betweeen November 1979 and March 1986, no trout cod have been caught in over 253 net nights.

The habitat requirements of trout cod are poorly documented. Victorian studies indicate that the favoured habitat is fast flowing water over rock and sand-gravel substrates. Cadwallader (1979) and Cadwallader and Backhouse (1983) found large trout cod in deep holes between rapids and smaller fish beneath and amongst boulders.

The reason for the decline in range and abundance of trout cod is uncertain but it is probably due to one or more of the following factors: changes in flow regimes, siltation of spawning beds and "river improvement" activities such as de-snagging. Aquarium studies have indicated that young trout cod are aggressive and establish well defined territories. This behaviour as well as similarities in habitat requirements and diet indicate that competition with introduced trout also has been an important factor in the decline of trout cod.

Berra (1974) noted the heavy angling pressure in the ACT directed primarily at the Murray cod. Anecdotal information suggests that where Murray and trout cod occur together it was usually the trout cod which were caught first. The decline of trout cod in the ACT is reflected by the overall decline in native fish stocks in local streams which has been attributed to overfishing (Greenham 1981).

Berra (1974) concluded that "The population of trout cod in the Murrumbidgee River is probably so diffuse as to be unreliable as a source of survival."

Conclusion

Since no specimen has been recorded in the ACT since the 1970's despite extensive sampling of likely habitat, it is concluded that the trout cod may no longer be present.

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Notes on the Diet of Three Mammals Presumed to be Extinct: the Pig Footed Bandicoot, the Lesser Bilby and the Desert Rat Kangaroo

By Joan M. Dixon*

Introduction

Since European colonisation of Australia, a number of mammal species, particularly species of the semi-arid and arid zone woodlands have become rare or extinct. Some of these seem to have vanished forever, for a variety of reasons, including natural processes of extinction as well as the effect of Europeans on their habitat. Presumed extinct are *Chaeropus ecaudatus* the Pig-footed Bandicoot, *Macrotis leucura,* the Lesser Bilby, and *Caloprymnus campestris* the Desert Rat-kangaroo. There is little published information available on their dietary habits. The author has dissected the intestinal tract of preserved museum specimens to determine dietary contents. The results are limited as they are based on restricted samples of specimens, but they do provide some interesting data, filling gaps in existing knowledge.

Methods

Identification of insect material present in stomach/colon contents was done by the Museum's entomologists. The contents were macerated in alcohol and fragments were removed for examination and determination.

In presenting the analysis of stomach/colon contents, the main purpose is to stimulate others to examine similar contents held in their collections. It should be realised the results presented are from a very small sample. The assumptions and conclusions drawn from these samples are simply to provide some clues to the diet of the animal, and only further detailed investigations will elucidate the full dietary components.

Fig. 1. Pig-footed Bandicoot *Chaeropus ecaudatus* from 'The Mammals of Australia'. John Gould (1845-63).

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Species Examined

***Chaeropus ecaudatus*, the Pig-footed Bandicoot**

One of the species which appears to have become extinct is the Pig-footed Bandicoot, (Fig. 1), formerly an inhabitant of much of inland Australia from the north-west of Victoria, south-west of New South Wales, and the deserts of South Australia, Northern Territory and Western Australia. There is only a single record of a live specimen being captured this century.

Few notes are available on its general biology. Those made by Gerard Krefft (1865) are often cited. He studied specimens caught by the aboriginal people and brought to him from environs of the Murray – Darling rivers.

The diet of Pig-footed Bandicoots was described by Krefft as being mainly herbivorous. This was based on his observations of their droppings. and on their acceptance of grasses, leaves and bulbous roots, He noted that some insects, particularly grasshoppers, were eaten, but this was the extent of their carnivorous habits, unlike those of other bandicoots. While Sturt commented that it was partial to flesh (Sturt, 1848), Gould (1863) noted that its diet consisted of insects and their larvae, and probably some kind of vegetation.

There are a number of specimens of *Chaeropus* in museum collections. While a reasonably large representation is in the form of exhibits, skins or skeletons, there are spirit-preserved specimens in which some intestinal contents are available for study. I have examined two of the spirit preserved specimens in the research collections of the Museum of Victoria, (C469, from central Australia, C5861, from Alice Springs, Northern Territory) and analysed the contents. The faecal pellets are ovoid in shape, approximately 1.5 cm x 1.0 cm. The components of the pellets consist almost entirely of grasses, but the species could not be determined. All contents are finely chewed up and bound tightly into the pellets.

***Macrotis leucura*, the Lesser Bilby**

This species, (Fig. 2) has been recorded on only six occasions from the deserts of

Fig. 2. Lesser Bilby *Macrotis leucura* from 'A catalogue of the Monotremata and Marsupialia in the collection of the British Museum (Natural History)' Oldfield Thomas (1888).

Fig. 3. Desert Rat kangaroo *Caloprymnus campestris* from 'The Mammals of Australia' John Gould (1845-63).

north-eastern South Australia and south-eastern Northern Territory, where surface water is rarely available. The last specimen reported alive was found in 1931 near Cooncherie in South Australia. It is not known whether the species still survives. Johnson (1983) commented on its diet based on limited stomach contents analysis. He found that they contained large quantities of skin and fur of rodents, seeds probably from *Solanum* sp. and sand. No insect fragments could be recognised.

In the Museum of Victoria there are four spirit preserved specimens of this species. One of these (C486 from central Australia) had a full stomach and colon. The contents were extracted and analysed. The stomach contents yielded two species of ants Family Formicidae, termites of the Order Isoptera as well as another unidentifiable insect species. The colon contained Formicidae and Isoptera.

***Caloprymnus campestris*, the Desert Rat-kangaroo**

This species, (Fig. 3) once an inhabitant of the hottest and most arid areas of Australia was described in 1843. It was not recovered again until 1931, when a specimen was collected near Cooncherie, South Australia, and live animals sighted as late as 1935 (Finlayson, 1936).

No information is available in the literature on the food preferences of *C. campestris*. Contents of the stomach, caecum and colon were examined from a specimen (NMV C6789) collected in South Australia at Mulka via Marree in 1932. Beetles, Order Coleoptera were present throughout. There was the possibility of the occurrence of weevils, Family Curculionidae as well as members of the Family Tenebrionidae, however the material was too finely digested to enable further identification.

Acknowledgements

Thanks are extended to Mr. Ken Walker Entomology Department, Museum of Victoria for assistance in determination of insect species and to Dr. David Robertson, University of Melbourne for checking the plant contents.

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Blackburn Lake Sanctuary

The Day Group recently had an excursion to the Lake and were pleasantly surprised at the improvements since our last visit in 1980. This time our leader had arranged for our group to visit the Information Center, a new addition since our last trip to the Park. The Information Center with all amenities is built in the Northern section along Central Road and has a large picnic and play ground area surrounded by native trees planted in abundance to attract and provide food for native birds. A car park is provided for visitors.

Mrs. Dorothy Meagher, the Education Program Co-ordinator has been the prime mover in the formation of "The Friends of the Lake" who are a group of enthusiasts involved in giving talks to the thousands of children who visit the Lake, to arouse an interest in the Flora and Fauna of the Park and the need to protect them. The "Friends of the Lake" guide groups around the tracks to show the various plants and the need to walk only along the tracks provided.

The Information Center has photographs of the early history of the Park and displays of the Birds, Animals and Plants to be seen in the area, there is also an audio-visual unit that shows the story of the Park with a commentary.

Back in 1975 Mr. Roy Wheeler, the well known ornithologist led our Group around the Lake and he said then, that next to the Botanical Gardens the Blackburn Lake was the best place around Melbourne to see birds. Today up to 180 species have been recorded for the area. At first the official Park consisted of 5.8 hectares, in 1976 a further 13.4 hectares were purchased and finally another 6.6 were added in 1980. The whole area is now the Blackburn Lake Sanctuary and is owned by the City of Nunawading. It is a credit to those ardent people who have striven over many years to enlarge and improve the area and to also make it a popular recreation park and an attraction as it was many years ago when train loads of Melbourne people went to enjoy Blackburn Lake.

A practical use is made of the Lake by the M.M.B.W., the Lake is used as a retarding basin to stop flash floods from the upstream area flooding the area of Gardiners Creek lower down.

Any member of the F.N.C.V. interested in Birds or Botany should visit the Blackburn Lake, it is easy to get to. See the Melway Map Ref. 48 C-11.

Take the train to Blackburn Station then walk one kilometre to the Park entrance in Central Road or catch No. 736 bus on the South side of the station right to the Park gate.

Anyone wishing to know about the Blackburn Lake Sanctuary or "The Friends of the Lake" can telephone Mrs. Dorothy Meagher 873 2619.

(D. E. McInnes, Sect. Day Group)

Proposed Management Plan for Wychitella Flora and Fauna Reserve

The Department of Conservation Forests and Lands has prepared a Resource Inventory and proposed management Plan for the Wychitella Flora and Fauna Reserve. The Reserve is of statewide significance, containing a population of Mallee Fowl and its equally rare and endangered habitat.

The Resource Inventory describes the natural and cultural values of the reserve. The DCFL invites public comment on the Resource Inventory and Management Plan, copies of which are available ($4.00 or $6.00 posted) from the Information Centre, DCFL, 240 Victoria Pde., East Melbourne 3001.

Notes on Cofounded Nests in Three Species of Social Bees in the Genus *Exoneura* (Hymenoptera; Anthophoridae)

By Michael P. Schwarz*

Abstract

Trap nesting indicates that most newly founded nests of *Exoneura bicincta*, *E. richardsoni* and *E. bicolor* are inhabited by more than one adult female. One cofounded nest of an unidentified *Exoneura* species was also found. Cofounding is therefore common in at least several allodapine bees and may not have been recognized in others because of the lack of trap-nesting procedures. This may require the reinterpretation of some published data. Cofounded nests of *E. richardsoni* appear to be initiated at varying times throughout the year and may contain both eggs and pupae, suggesting that some eusocial colonies may be derived from cofoundress associations.

Introduction

In many species of social bees for which adequate data is available, colonies are derived from singly founded nests (ie. haplometrosis), or in some socially advanced species, by a single queen accompanied by a swarm of workers (Michener 1974). Haplometrosis ensures that future colony members are related and therefore facilitates the evolution kin-selected altruism. Cofounding is comparatively rare, but has been reported for a few halictine bees (Abrams and Eickwort 1981; Michener and Lange 1958a,b; Packer and Knerer 1986; Kukuk pers. comm.). In recent years, cofounding has also been reported for several xylocopine bees from Taiwan and Japan, although the frequency of cofounded nests among newly built nests as a whole has been low (*Ceratina japonica*, 1.3%, n = 230, Michener 1985; *Braunsapis sauteriella*, 9.1%, n = 66, Maeta *et al.* 1985). However, recent work on an Australian allodapine bee, *Exoneura bicolor*, indicated that the majority of newly founded nests in a natural population contained more than one adult female, with a maximum of eight cofoundresses per nest (Schwarz 1986, 1987). Furthermore, cofoundresses were found to be closely related to each other, indicating a high degree of kin association during founding. This finding has consequences for evolution of sociality because it demonstrates that colonies of related females can arise by joining and accepting behaviour, rather than through development of singly-founded nests. In this paper I present some preliminary findings demonstrating that cofounding is common in two other species of *Exoneura*, and occurs in a fourth.

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Methods

Nests were collected from the study site used by Schwarz (1986) in the Sherbrooke Forest Park near Belgrave, Victoria. Four allodapine bees occur in this area, *E. bicolor*, *E. richardsoni*, *E. bicincta* and an unidentified species (referred to here as *Exoneura* sp. 1). Voucher specimens of all four species are deposited in the Australian National Insect Collection, Canberra. All species utilize dead fronds of the tree fern *Dicksonia antarctica* as nesting sites. In August and September 1985 approximately 500 trap nests were set out among nesting aggregations around tree ferns. Trap nests were simply dead, dry fern fronds which did not contain *Exoneura* nests and were marked with coloured plastic tape. Brood of all *Exoneura* spp. in the study area do not reach adult eclosion until mid-January. Therefore, all adults found in trap nests before mid-January were assumed to be foundresses rather then mature brood raised *in situ*.

Trap nests were collected between 18 December 1985 and 9 January 1986, either before sunrise or during periods of rain, and consequently all nestmates were assumed

present. To determine larval placement within nests, unopened nests were cooled to 4°C (adult movement ceases at this temperature) and a small volume of diethyl ether was pipetted into the nest to anaesthetize adults. These nests were then split open, taking care not to disturb the positions of nest occupants.

Females were fixed in Kahle's Solution for at least 8 days before dissection in 70% ethanol. Ovarian development of females was measured and the presence of any endoparasites noted. Some females exhibited a pathological condition in which ovaries were replaced to various extents by a white granular material (Schwarz, 1986). Wing wear, used as an indication of flight activity was measured by counting the number of nicks in the margins of both forewings.

Results

Dissection data and nest contents for all newly founded nests of *E. bicincta*, *E. richardsoni* and *Exoneura* sp 1, are given in Table 1.

Nest architecture and placement of immatures within nests is similar to that described for *E. bicolor* (Schwarz 1986). Eggs are laid in a common clump at the bottom of the nest lumen and larvae usually occur in a contiguous group in the rear portion of the nest. Occasionally, when brood sizes are large, there may be spaces between eggs and larvae or between groups of larvae. Irregularly shaped pollen balls were distributed among groups of smaller larvae, and two smaller larvae were often found feeding from a single pollen mass. Older larvae usually feed from a pollen mass placed on their venters, though in some nests two fourth instar larvae were observed feeding from a common pollen mass. In a few nests of *E. richardsoni* pollen balls were found in the bottom of the nest lumen away from brood. Pollen balls were also found in two nests where larval eclosion had not commenced and may represent a form of food storage.

Discussion

Most newly founded nests of *E. richardsoni* and *E. bicincta* collected were occupied by more than one foundress. Available sample sizes are too small to determine the distribution of colony sizes or place an upper limit on the number of cofoundresses that may occupy a single nest. Furthermore, it is likely that some nests of *E. richardsoni* had already suffered adult mortality. For example, nests 14, 17, 19, 20, 22 and 35 all contained advanced brood, yet foundresses had little or no wing wear. Hence it appears that in some nests initial colony sizes were larger than at the time of nest collection.

The small number of nests available and the restricted sampling period makes it difficult to characterize sociality in these species. However, some comparisons with *E. bicolor* can be made. Unlike *E. bicolor*, nests of *E. richardsoni* appear to have been initiated at widely different times during spring and early summer. For example, nests 15, 24 and 29 contained eggs only, although some other nests (17, 20, 22, 26 and 35) contained pupae. This apparent disparity in timing of nest initiation also occurs in *E. bicincta* (cf. nests 3, 5, 9, 10 and 11). *E. richardsoni* further differs from *E. bicolor* in that in some nests there is a wide range in developmental stages of brood. Both eggs and pupae or prepupae were found in nests 17, 19, 21, 22 and 26). Such an overlap of generations in other species may give rise to (temporarally) eusocial colonies (Michener 1965, 1974, 1985), allowing the possibility that eusociality may arise in cofounded nests in *E. richardsoni*.

Measurement of wing wear suggests that not all females engage in foraging activity to the same extent. For example, wing wear varies widely among nestmates in nests 3 and 8 (*E. bicincta*) and 13, 21 and 23 (*E. richardsoni*). There does not appear to be any consistent relationship between wing wear and ovarian size. For example, *E. richardsoni* females with enlarged ovaries were found with very worn wings (nests 13, 25 and 29) or little worn wings (nests 14 and 18). Similarly, females with small to minute ovaries ranged from high wing wear (nests 23 and 28) to little or no wing wear (nests

Table 1.

NEST No.[1]	ADULT DISSECTION DATA[2]	NUMBER OF IMMATURES						DATE
		Eggs	Larvae			Prepupae	Pupae	
			Small	Med.	Large			
Exoneura sp. 1								
1	Ar + 1, Ar + 4	6	–	–	–	–	–	30.XII
E. bicincta								
2	Br + 4, Dr + 0	3	2	3	3	–	–	18.XII
3	A + 9, Br + 1, D + 5, D + 0	6	3	–	–	–	–	18.XII
4 I	P?3	–	–	–	–	–	–	21.XII
5	Dr + 6	4	–	–	–	–	–	21.XII
6	P-7, Dr + ?	2	5	–	–	–	–	21.XII
7	Dr + 12	–	–	–	–	–	–	30.XII
8	DPr + 14, Dr + 3, Er?4, Dr + 4	–	–	4	3	–	–	30.XII
9 I	Cr + 9, P?3, E + 16	–	–	–	9	6	–	30.XII
10	A + 8, Br + 7	6	–	–	–	–	–	9.1
11	E + 11	–	–	–	1	–	2	9.1
E. richardsoni								
12	Cr + 0, Dr + 0	8	5	1	–	–	–	18.XII
13	AP + 16, B-4, BPr + 0	5	1	2	4	–	–	18.XII
14	A + 1, D + 1	5	1	5	1	–	–	18.XII
15	Cr + 11	3	–	–	–	–	–	18.XII
16	Cr + 0	–	–	–	–	–	–	18.XII
17	Dr + 0, Dr + 2	1	2	2	2	2	5	21.XII
18	A + 3, Dr + 2, Dr + 2	8	2	4	1	–	–	21.XII
19	Cr + 0, Cr + 0	6	1	–	2	4	–	21.XII
20 I	CP + 1, D + 3	–	–	–	–	–	6	21.XII
21	Cr + 15, D + 1	1	–	–	–	3	–	21.XII
22	Cr + 0, Dr + 0, Er-0	4	1	1	3	4	5	30.XII
23	Cr + 2, Er-10	4	1	4	–	–	–	30.XII
24	B + 4, Cr + 0	1	–	–	–	–	–	30.XII
25 I	A + > 20	9	–	–	–	–	–	30.XII
26 I	Cr + 2, Dr-3, Er + 3	3	5	1	5	1	5	30.XII
27	B + 2	–	–	–	–	–	–	30.XII
28 I	E + 13	–	–	1	2	–	–	30.XII
29	Ar?> 20, Dr??	7	–	–	–	–	–	31.XII
30	Cr-13	–	–	–	–	–	–	3.1
31	Dr + 2	–	–	–	–	–	–	3.1
32	Cr + 8	–	–	–	2	–	–	3.1
33	Br + 9	–	–	–	–	–	–	9.1
34	Dr + 1, Dr + 4	–	–	–	4	4	–	9.1
35	P + 0	–	–	–	–	–	2	9.1

Contents of newly founded nests of three species of Exoneura. Table gives the number of adult females and brood of varying developmental stages, as well as the ovarian condition, insemination status and wing wear of each foundress.

[1]: An 'I' following the Nest number indicates that an adult female of the cuckoo bee *Inquilina* (Michener 1983) was present in the nest.

[2]: Ovarian condition and wing wear of adult females. For each foundress ovarian condition is indicated by capital letters thus: 'A' – ovaries enlarged with at least one oocyte near egg-size, 'B' – ovaries enlarged, but non near egg size, 'C' – ovaries medium sized (largest oocyte less than half length of mature oocyte), 'D' ovaries small with terminal oocytes restricted to anterior half of ovary and 'E' – ovaries pedunculate and oocytes minute. 'P' indicates a pathological state, either presence of endoparasites or ovary granulation. 'r' indicates resorption of terminal oocytes. Presence/absence of sperm in the spermatheca is indicated by +/–. Number of wing nicks for each female is given in arabic numerals. If a particular variable, eg. wing wear, was not measureable, a '?' is given in its place.

22, 26, 31 and 34). Disparity in ovarian size of females within a single nest (eg. nests 3, 14, 18 and 29) suggests that reproductive differentiation may occur among cofoundresses. However, this difference could also be due to the disjunct egg-laying periods of nestmates. If reproductive differentiation does occur, comparison of sociality in these species with *E. bicolor* (where reproductive differentiation among cofoundresses is absent) may allow factors facilitating evolution of castes in allodapine bees to be identified.

Findings presented here indicate that cofounding is common in at least three species of *Exoneura*, and occurs in a fourth. It is possible that cofounding also occurs in other species, but has only been recognized here because of trap-nesting. This has consequences for the development of sociality in subsequent nest re-use, since cofounding will decrease mean intra-colony relatedness in subsequent colony stages. Michener (1971, p. 227) has noted that his discussion of group behaviour of African allodapine bees rests on the assumption that females do not readily join nests of conspecifics.

The possible existence of reproductive differentiation in *E. richardsoni* is interesting and may allow testing of the hypothesis (Schwarz 1987) that lack of reproductive castes in cofounded nests of *E. bicolor* is due to rapid egg production and stockpiling. Studies on sociality in *E. richardsoni* and *E. bicincta* may yield some valuable information on what factors facilitate the evolution of social behaviour.

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Proposed Management Plan for the Dandenong Ranges National Park

The Department of Conservation Forests and Lands is inviting comment on this management plan, which specifies conservation and management practices, levels of use and further developments to be undertaken in the park.

Copies of the plan are available from the Information Centre, DCFL, 240 Victoria Pde., East Melbourne 3001 ($4.00 or $5.50 posted).

Written submissions are due by March 31, 1988.

Amphibian and Reptile Fatalities Caused by Chlordane Spraying?

BY KLAUS HENLE*

Chlordane, an organochloride pesticide is widely used against termites in western NSW. As in all national parks in the western region of NSW the huts at the station in Kinchega National Park were routinely sprayed every year (Novaki, pers. comm.). De Witt & George (1960) and Ernst (1962) reported on snake deaths caused by broad applications of chlordane and other organochlorides, and the sensitivity of freshwater organisms and terrestrial vertebrates to these pesticides is well documented (Brown 1978). This note addresses similar observations made in Kinchega.

In January 1986 the huts at the Kinchega National Park station were treated with chlordane by a professional agency. The walls and the base of all huts with carrying wooden constructions were sprayed but large parts of the underside of one hut were spared as effective spraying would have necessitated the operator to lie on the ground. The following day three dead skinks (2 juvenile *Morethia boulengeri,* 1 subadult *Lerista punctovittata*) were found dead with bent bodies in open areas directly in front of the sprayed huts. Most likely several additional specimens died in concealed places as a minimum of 10, but possibly many more, juvenile *M. boulengeri,* which lived in a narrow strip of vegetation alongside one of the treated huts and used cracks in its walls as hiding places, were never observed again while in non treated areas at the station no decrease in the number of juvenile skinks could be detected.

Amphibians also seemed to be affected by the spraying possibly by secondary poisoning. Six frogs (5 *Litoria caerulea,* 1 *L. peronii*) were found dying with repeated bursts of tetanic constrictions of all major body muscles. Before death all six frogs secreted heavily a viscous liquid from their dorsal poison glands. Again, probably more frogs died than were observed as no frog was found afterwards around the station but more than nine were known to live in and around the huts before the spraying.

Frogs are sensitive to chemical pollutants (see Honegger 1981 for an introduction to some of the literature) and thus may be useful as natural pollution monitors (Birge et al. 1979; Tyler 1983). Unusual amphibian mortalities or developmental anomalies may even lead to the discovery of serious environmental pollution (Henle 1983). Less is known about the influence of organochlorines on reptiles (Bauerle et al. 1975) but several cases of death and/or population declines due to organochloride pesticides have been documented (Honegger 1981). The observations at Kinchega appear to be a further demonstration of the dangers of an indiscriminate use of chlordane (and other chlor-based pesticides). They call for alternatives – ideally the use of termite resistant building material.

The recent restrictions to the sale, supply and use of chlordane by the NSW Government (Department of Agriculture, in litt.) is certainly a step in the right direction although there are obvious difficulties in ensuring that pest control operators really use chlordane only when and where appropriate and in the right way: E.g. at Kinchega, not even the windows to kitchen and food store room were checked to make sure that they were securely closed before the start of spraying; some parts of the huts especially prone to termite attacks were left untreated while others where attacks are not possible were heavily sprayed; seemingly the pest control operator lacked sufficient knowledge of potential dangers of organochloride pesticides to non target organisms and humans. The recent decision of the western region of the NSW National Parks and

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Wildlife Service to replace routine spraying by regular inspections with a directed treatment only when and where necessary is encouraging.

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King Island Anniversaries

On Friday 23 October 1987 ten members of the Field Naturalists Club of Victoria left Tullamarine in a SAAB 340 aircraft for King Island, to take part in the 25th anniversary celebration of the founding of the King Island Field Naturalists Club, which, by a happy chance, coincided very nearly with the arrival of the FNCV expedition to King Island on 3 November 1887.

Once settled in our guesthouse in Currie, the members of the party were free to employ the afternoon as they wished. Everyone first visited the Museum, formerly the lighthouse keeper's house, where relics of all aspects of life on the island were on display, and one was left in no doubt about the importance of shipwrecks in the history of the island. After that we explored the surroundings of Currie. South of the lighthouse is the golf course, and the road beside it leads to a beach which was littered with thousands of abalone shells, which two young boys were collecting in sacks. Further south round the headland is the factory where kelp is dried and prepared for export. Turning north from the golf course the path leads back to the harbour. Currie is the base for the island's crayfish industry, but on this afternoon the harbour was almost deserted, except for sea-birds, and naturalists admiring the plants which have established themselves here, white mignonette (*Reseda alba*) and purple senecio (*Senecio elegans*), which were flowering beside the path. The cliff above is covered with African box-thorn (*Lycium ferocissimum*). The 1887 expedition reported an abundance of watercress (*Rorippa nasturtium aquaticum*) in this area. This has largely disappeared, but Jim Willis found a small patch of it at the far end of Big Beach. On Sunday, along South Yellow Rock Road, we came upon a creek and dam covered with it, in full bloom, which made a striking sight against the green of the paddocks.

On Friday evening Graham Batey, secretary of the King Island Field Naturalists Club, collected us and took us to the home of Audrey Graham, where the huge sunroom enabled us to watch the Currie sunset while enjoying a smorgasbord dinner, and meeting many fellow naturalists. Here we were joined by two country members of our Club, Eulalie and Os Brewster, who were visiting their son on the island.

In an adjoining room copies of the photographs taken on the 1887 expedition were on display, annotated with excerpts from the narrative of the expedition; also copies of this, maps of the island, and the plant list, which was compiled by the late Ian Cameron, and published in the *Victorian Naturalist* v. 89, Oct. 1972. Later in the evening a display of plant specimens from the island was put up. All this generated much interest and discussion, and amongst those present was the grandson of the hunter, Grave, who acted as guide to the expedition.

Opening the meeting the President of the King Island FNC, Dennis Whitchurch, welcomed all the members and visitors, and expressed pleasure that the idea of holding this celebration had met with such enthusiastic response. Greetings were delivered from the Launceston FNC, the Devonport FNC, and the Federation of Field Naturalists Clubs of Tasmania, and Dr. Willis, on behalf of the FNCV, presented the President with a book to commemorate the occasion. Dennis Whitchurch then asked Jim Paterson, a foundation member of the King Island FNC to recall some of the early activities of the club, from its establishment on 16 October 1962, under the presidency of Ian Cameron, and later Paul Barnett. Dr. Willis gave an illustrated talk on the flora of the island, once the problem of a projector stand had been solved by the production of an ironing board, which concluded a most enjoyable and memorable evening.

The meeting place next morning was the Pegarah Forestry Reserve, whither we were taken in the school bus. Birds sighted along the road included the banded plover, white-faced heron, and the Forestry entrance, sulphur-crested cockatoos. We drove some distance into the reserve, and then left the bus to walk down a broad grassy track to the creek. Satinwood (*Phebalium squameum*) was flowering here, and we noted the monkey-flower (*Mimulus repens*), and the little *Caladenia pusilla*, so-called "King Island orchid", also the mayfly orchid (*Acianthus caudatus*) and the bird orchid (*Chiloglottis gunnii*). The more energetic members of the party continued along the creek, where the rough and soft tree ferns (*Cyathea australis, Dicksonia antarctica*) grow, the latter to unusually large size. Here were several interesting fungi and masses or bryophytes that were named for us on the spot by Dr. George Scott, Warden of Queen's College, Melbourne University. The other returned to the bus, which our intrepid driver drove to the lunch rendezvous beside a pine plantation, which yielded some fine examples of *Thelephora terrestris*. Nearby was a small pond completely covered with Pacific azolla (*Azolla*

Members of King Island FNC and FNCV at lunch at Yellow Rock River, 25 October, 1987.

filiculoides), with a little patch of *Mazus pumilio*, near its edge. We saw a magnificent *Hibbertia empetrifolia* festooning the surrounding foliage to a height of about 3 metres. On our return journey a stop was made at an ironstone gravel quarry in search of orchids. The twisted sun orchid (*Thelymitra flexuosa*) was found here; also a copperhead snake.

At Naracoopa the party divided again, some continuing in the bus to Sea Elephant Plains, while others walked along the beach to the Fraser River, where we saw the "extremely fine sand, compact and perfectly black in colour" which Sir Baldwin Spencer noted in 1887. One member of the party went fishing off the end of the Naracoopa jetty, returning with a 75cm fish which would have gladdened the hearts of the pioneer naturalists, who reported that "the east coast provisions had given out sooner than expected". When we were reassembled – a search party had to be sent out for enthusiastic shell-hunters – the bird observers reported seeing an Australian kestral, Pacific gulls, terns and sooty oyster catcher. Grey teal was sighted on the return journey.

After dinner at the Soldier Settlers Club, where briefly we watched an indoor wood-chopping competition, we were entertained at the home of Charlotte Denton, where, with the aid of another ironing board, Jim Willis showed more slides and concluded his talk on the flora of the island, for which there had not been time the previous evening. Mrs. Denton showed us the large quilted wall-hanging depicting scenes from the life and history of the island which the C.W.A. has made for the Bicentenary. Included in one of the panels was the orange-bellied parrot, which is seen on the island during migration.

On Sunday the geologists in the party went to the Petrified Forest, while the rest of us were picked up by our hosts and headed northwards to the Yellow Rock River, detouring along the Heddles Road to a swampy area wher the lizard orchid (*Burnettia cuneata*) had been seen two days previously. Diligent search amongst the pink swamp heath (*Sprengelia incarnata*) yielded nothing, except some leeches, to our disappointment, but by the roadside we found *Boronia nana*, *Caladenia pusilla*, and the stems of *Calochilus robertsonii* which had passed flowering. Along the road we passed the Eulalie Bennett reserve, a name which will be familiar to older members of the Club, which has been planted by her granddaughter-in-law.

Wild turkeys are seen all over the island, and in this area swamp harriers, kestrels and grey teal were among the birds sighted.

Lunch was eaten on the banks of the Yellow Rock River, close to the site where the FNCV expedition landed and set up their headquarters camp. "in an amphitheatre of ancient sand dunes, clothed with thick scrub" where "almost complete shelter was secured from prevailing winds and weather". The river has changed its course in the last hundred years, so that the "horseshoe-shaped billabong" has disappeared, but Dennis Whitchurch pointed out the exact spot where the camp was pitched. In 1887 Dudley Le Souef reported on the reptile called by the local inhabitants "the red water snake", which, "when seen, was sunning itself on the banks of the Yellow Rock River, but, on being disturbed, at once made for the water and escaped." It may well have been a descendent of this snake which was observed swimming *towards* us, just as we had settled ourselves on the bank! After lunch there was just time for those who were departing on the afternoon flight to walk to the mouth of the Yellow Rock River, and admire the broad sweep of the beach along Phoques Bay. The remainder went beach-combing and photographing in this magnificent area.

Shell specialist, Margaret Richmond (from Devonport) and Jim Willis were in their element, the latter bringing his tally of marine molluscs collected during this excursion to 90 species. Later in the afternoon visits were made to Cape Wickham (at the N.W. point) and Lake Martha Lavinia (N.E.) where the very rare orchid *Caladenia capitata* was found in bloom, also late-flowering redbeaks (*Lyperanthus nigricans*).

The weather was mild and sunny all the weekend, in which human and natural history were most enjoyably mixed. Our thanks go the the King Island Field Naturalist Club and their friends for their welcome and hospitality, and the effort put in to make the celebrations so successful.

My thanks go to Eulalie Brewster who kept the bird-tally for the weekend and Dr. Jim Willis for additional material.

Shiela Houghton

Springtime Get-together of V.F.N.C.A. at Waranga Basin, October 16th to 18th, 1987

Fifty five persons from six Victorian Clubs attended this Get-Together held at Waranga Basin holiday camp. The R.A.C.V. notes mention that the Waranga Reservoir was formed on the site of a natural swamp by the construction of a 7.25 kilometre long earthen embankment. This work began in 1902 and was completed in 1905. In 1926 the reservoir was enlarged and now has a capacity of 410,000 Ml to a depth of over 9 metres. The main Waranga Channel carries water over a distance of 370 km. to the Wimmera and Mallee Districts

The Pavilion type camp of mud-brick with a red corrugated iron roof was situated close to the water's edge on the west side of the Basin, so that it was possible to view water birds from the dining room windows, there were many black swans, two pelicans, grey teal, an occasional cormorant and some whiskered terns, as well as many silver gulls. Along the shore were small flocks of red backed parrots and families of white fronted chats and galahs in the Yellow Box trees (*Euclaytpus melliodora*). South of the camp and south of the nearby town of **Rushworth** is the **Whroo** forest said to be the largest iron-bark (*E. sideroxylan*) forest in Victoria.

On the Friday night after our arrival we enjoyed an illustrated talk on local flora by Mr. and Mrs. Ted Beasley. Mr. Beasley invited us to view their native garden in Rushworth, this we all did on the Sunday morning, our final day; more about this later.

Our departure from Melbourne was somewhat delayed, thus we had our lunch at a roadside stop north of **Wallan** where the Nodding Greenhoods (*Pterostyles nutans*) were in sheets; we also made a botanical stop at Mt. Ida State Forest between Heathcote and Colbinabbin where there were lovely stands of the Golden Everlasting (*Helichrysum bracteatum*) interspersed with Vanilla Lillies (*Dicpopogon strictus*) and the Daphne Heath (*Brachyloma daphnoides*) in flower and stands of the tall Blue Sun-orchids (*Thelymitra nuda*) which were unopened as the weather during the entire weekend was overcast with showers and sunny periods, but quite warm and humid.

At **Rushworth** we were delighted to see several kangaroos on the golf course some with joeys in their pouches. We were in the Box and Iron Bark Forests of the Goldfields areas, where quartz reefs permeate outcrops of folded slate and sandstone strata. Red Box (*E. polyanthemos*) and Long leaved Box (*E. goncocalyx*) occupied the rocky ridges, whereas Grey Box (*E. microcarta*) and Yellow Box (*E. Melliodora*) and Yellow Gum (*E. leucoxylon*) and the beautiful furrowed black bark of the Red Ironbark (*E. sideroxylon*) stood out against the gentle green of the forest on the gravelly slopes.

On Saturday October 17th, the Ranger Ian Hoffman led us to the Whroo Forest for the entire day. Whroo is said to be an Aboriginal name meaning "Place of Lips", an Aboriginal waterhole which we visited, in order to drink one must crouch and put one's lips to the water. Firstly we visited the Whroo Cemetery, where some 300 gold diggers and families are buried. The last resident died in 1951, one quarter of the total number were children, who died of diptheria and other infectious diseases before the days of mass immunization. Chinese goldminers are also buried there in an unmarked corner as they were considered heathen and unfit for a proper burial, in many cases their bodies were taken back to China. We

were told that in 1853 1,000 people lived at Whroo, now no dwellings remain, the Church was finally demolished in 1952, but the nearby Balaclava Mine which furnished the money for Menzies to build his famous Melbourne Hotel is still a precipitate deep gash in the hillside, down which a party of "Adventurers" from Shepparton were practising abseiling. Our party descended the steep steps into the mine and many walked through the underground rock tunnel to the next cut, where they were picked up by the bus.

The Whroo Forest is of immature trees of which there is 23,000 hectares as the Ranger explained, and that the Box and Ironbark trees take over 100 years to mature. 1,000 hectares of the forest is now designated mature.

We noted some exotic trees at Whroo, for instance, Murray Pine (*Callitris columellaris*) which was said to have been sent with some 200 other exotics to be planted at Whroo by none other than Baron von Mueller.

In the forest, as in most of the gold fields forests, grew bushes of Chinese Scrub (*Cassinia arcuata*) which gave a curry-like perfume to the air, although it was not in flower

We were interested in the Plough Share Wattle (*Acacia gunnii*) and the white and blue clumps of *Brachycome multiflora* daisies. Also the vast areas of grevillea (*Grevillea alpina*) varying in colours from green-pink to apricot and yellow, and some red Grevillea rosmarinifolia; in one area we were shown some hybrid specimens of the two grevilleas. Also the Rosy Heath Myrtle (*Baeckea ramosissima*) was in flower. In one area mint bushes were in flower (*Prostanthera denticulata*) we saw two rare varieties, a white and another pink with a deep throat, specimens of which had been sent to Effie Mullins in Canberra. *Boronia anemonifolia*, the sticky boronia, was in flower. We were told that this smelt like foxes, but we were unable to confirm this myth.

For the orchid fanatics in the party there were many purplish beard orchids (*Calochilus robertsonii*). At one stage there was great excitement as a naked beard orchid (*Calochilus imberis*) was thought to have been found, but the excitement collapsed when it turned out to be a Brown beard orchid eaten probably by an insect.

There were blue, red and yellow sun orchids (Thelymitra nuda, rubra and antennifera) all tightly shut and flower heads of Brunonia, Caladenias (*C. Cucullata*) and carpets of small Rice Flowers (*Pimelea humilis*) and some slender daisy bush (*Olearia teretifolia*) and some pink Calythrix tetragona.

On Saturday evening, after a short meeting, Ted Harrison, an experienced bushman from Benalla, showed us some exquisite slides of Sugar Gliders which he said he had never shown to a large audience previously.

On Sunday morning, October 18th, we visited the above mentioned native garden of Mr. and Mrs. Ted Beasley in Rushworth. They had a shade house with numerous flowering native orchids and a terraced garden full of native flowers, trees and shrubs, with especially showy varieties of Eremophilia.

After lunch in the forest near Costerfield where the ground was covered with golden mounds of *Pultenea pedunculata* we said farewells to other Clubs and visited an old antimony mine at Costerfield where Marie Allender picked up some beautiful **Stibnite** crystals. Dorothy Dawson and Co "clocked up" 55 species of birds during the weekend, including waders and water birds at Waranga basin, raptors including the Wedge tailed Eagle, three species of Cuckoo, the Pallid, Golden (Shining) Bronze and the Fan-tail and parrots – red-backed, blue winged, King, Eastern and Crimson Rosellas and four species of Honeyeater – Yellow tufted, New Holland, Friscous and Whited naped.

From a Field Naturalists viewpoint it was a rewarding and enjoyable weekend.

Elizabeth K. Turner M.D.
(with help from Mary Doery)

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50 Years Ago

WILD NATURE SHOW CANCELLED

At its meeting on August 31, the Committee of the Club decided unanimously to cancel arrangements for the Wild Nature Show, announced for October 26 and 27. It was felt that, in view of the infantile paralysis epidemic, it would be not only inadvisable but wrong to hold an exhibition largely intended for young people.

Victorian Nat. V. 54, Sept. 1937.

Subscriptions Now Due

Membership subscriptions are due at the beginning of the year. If you haven't yet renewed, please think of it. Prompt payment is a great help to the Club and ensures that you will continue to receive the Victorian Naturalist.

Flora and Fauna Guarantee Free Public Seminars

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Outline of the Bill
Landholder's View
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Question Time

These seminars are jointly sponsored by the Department of Conservation Forests and Lands, the Conservation Council of Victoria and the Victorian Farmers Federation.

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Cnr. Fenwick Street and Little Malop Street
24th February, 1988, 7.00-9.30 p.m.
RSVP: (052) 26 4666

Hamilton: Art Gallery Auditorium,
Brown Street
23rd February, 1988, 7.00-9.30p.m.
RSVP: (055) 72 2777

Sale: Macalister Room,
Princeton Convention/Motel
Princes Highway (Stratford side)
25th February, 1988, 7.00-9.30 p.m.
RSVP: (051) 74 6166

INSTRUCTIONS TO AUTHORS

The Victorian Naturalist invites contributions of original papers relating to Australian natural history, particularly of Victoria. All papers are assessed by an independent referee before publication.

Short contributions of natural history observations are also invited for use as "Naturalist Notes". These contributions may be edited, or excerpts published, at the Editors' discretion. Such notes are not normally refereed, and may be submitted more informally.

All contributions are to be written in concise, simple English.

For cost reasons, authors of original papers submitted for publication are requested to conform with the following guidelines. Any author who has difficulty in complying with these guidelines, or has queries concerning manuscripts, should consult the Editors before submitting a manuscript

Submission of Manuscripts

Manuscripts should be sent to The Editorial Committee, Victorian Naturalist, F.N.C.V., C/- The National Herbarium of Victoria, Birdwood Ave., South Yarra, 3141.

Two typewritten copies of the manuscript should be submitted. Authors are advised to retain a further copy.

Format

Text should be fully revised, typed double spaced on one side of the paper only, with a wide margin, pages numbered consecutively, and should conform in style to recent issues of the *Victorian Nat*

Author's name and address or institution should appear beneath the title. Underline only those words to be italicised in the text i.e. genus and species names, and titles of periodicals and books. All measurements should be expressed in the metric system (SI units).

References should be cited in the text as Brown (1981) or (Brown, 1981). Footnotes must be avoided. Acknowledgements should be grouped at the end of the paper before References.

References should be listed alphabetically by author's surname at the end of the paper. All references should be cited in the text. Abbreviations of titles of periodicals should conform with those in *A World List of Scientific Periodicals* (4th ed., Butterworth). Refer to recent issues of the *Victorian Nat.* for the formatting of references.

Tables and Figures

Tables should only be used for essential data needed to show important points in the text. They should be numbered consecutively, referred to in order in the text, and designed to fit within the print area of 115 x 180 mm. Each table must have an explanatory caption.

Figures may be in the form of drawings or photographs. They should be identified on the back with the author's name and the figure number. The top should be indicated and the magnification by scale where appropriate. Compass directions must be indicated where necessary. All figures should be referred to in the text and numbered consecutively (Fig. 1, Fig. 2 etc.).

Figures should be carefully prepared and should be submitted ready for publication. Each should have a short caption. Maximum size is 115 x 180 mm; single column width is 55 mm. Figures are preferably submitted at actual size. Lettering on Figures should be done by the author; care is needed to ensure that all letters are legible after reduction.

Line drawings should be made in black ink.

Photographs should only be used where essential due to the high cost of printing plates. They should preferably be unmounted, glossy black & white prints, showing good detail and moderate contrast.

Proof and Reprints

Galley proofs will be sent to the author, who should correct and return them as soon as possible. Only the minimum of corrections should be made.

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1-2 pp	3-4 pp	5-6 pp	7-8 pp	9-10 pp	11-12 pp	13-14 pp
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Orders for these 'reprints' must be made at the time authors return their corrected proofs to the editor.

Taxonomic Papers

Papers describing new taxa will not be accepted for publication unless the primary type material is deposited in a recognised public museum or herbarium.

It is suggested that in other more general papers where taxonomy is discussed, voucher material be lodged in a public collection, and the repository details cited in the text.

Special Note for Authors Using Wordprocessors

Many wordprocessing and microcomputer floppy disks can now be transcribed directly to our printer's typesetting equipment, saving the effort and cost of rekeying.

Authors of papers which have been typed on a wordprocessor should tell the editor (at the time the paper is first submitted), what type of machine and wordprocessing software was used. Note that printed copy must still be submitted.

Queries can be directed to Russell Thomson, 17 Powlett St., Heidelberg. 344 5704 (B.H.).

Field Naturalists Club of Victoria

In which is incorporated the Microscopical Society of Victoria
Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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His Excellency, The Rev Dr John Davis McCaughey, The Governor of Victoria.

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Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

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The Victorian Naturalist

Vol. 105, No. 2

March/April 1988

Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

$3·50

FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS (Second Monday)

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria Street, Melbourne.

Monday, 9th May, 8.00 p.m.
Annual General Meeting and President's Address.

Monday, 6th June, 8.00 p.m.
Dr. Jim Willis. (Meeting is a week earlier due to Queen's birthday holiday.)

New Members 28.11.87 to 1.2.88

Metropolitan:
Mr. Trevor Blake – East Ringwood, 3135.
Ms. V. Paris – Rosanna, 3084.
Ms. D. McLennan Croydon, 3136.
Ms. Judith Crane – Mont Albert, 3127.
Mr. David Beardsell – Ferntree Gully, 3156.
Mr. N.J. Hayward – South Yarra, 3141.

Joint Metropolitan:
Miss Tania Ireton and Gregory Ireton – Bonbeach, 3196.
Mr. Clive Gordes and Mrs. Fay Gordes – Patterson Lakes, 3197.
Mr. R. Tranter and Mrs. E. Tranter – Hampton, 3188.
Mike and Pat Coupar – Warrandyte, 3113.

Country:
Mr. Geof Bird – Lorne, 3232.
Mrs. Fay Jackman – Bendigo, 3550.

FNCV EXCURSIONS (First Sunday)

Sunday, 1st May. Knox Regeneration Project. Meet Andrew Paget at the Nursery, where he'll tell us about the project before we go on a tour of inspection. Coach leaves Batman Avenue, 9.30 a.m. Fare: $14. Bring a picnic lunch.

Sunday, 5th June. Seawinds. This is not planned as a boneseed pulling day, but it would be helpful if we could pull the odd plant as we go around, so gloves would be handy. There has been a lot of regeneration where boneseed has been removed.

Coach leaves Batman Avenue, 9.30 a.m. Bring a picnic lunch.

Monday, 22nd August-Friday, 26th August. Binnaburra, Lamington National Park. This can be made part of members' plans to visit Expo or other parts of Queensland. Please contact Maree Allender if interested – also if you would like other members to accompany you on an extension of this trip. Details: next *Naturalist*.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Avenue, South Yarra (150 metres nearer the Shrine than the Herbarium) at 8.00 p.m.

Botany Group – Second Thursday

Thursday, 12th May. "Fungi." Tom May.

Thursday, 9th June. "Kashmir – In Search of Wildflowers." Hilary Weatherhead.

Day Group – Third Thursday

Thursday, 19th May. Rockbeare Park and Northcote Pottery. Meet at Darebin Station at 11.30 a.m. (Catch the 10.56 a.m. train at Flinders Street) Leader: Joan Miller 836 2681.

Thursday, 16th June. Meteorological Centre, Spring Street. Meet at the Conservatory, Fitzroy Gardens, at 11.30 a.m. Leader: Andy Blackburn 379 8960.

Microscopical Group – Third Wednesday

Wednesday, 19th May. "Illuminating the Object. Setting up Suitable Lighting."

Wednesday, 15th June. "Preparation of Objects to be Examined Under the Microscope."

Mammal Survey Group – First Tuesday

Tuesday, 3rd May. "Vegetation Surveys, Diet Analysis and Habit Delimitations." David Cheal.

Tuesday, 7th June. Members' Night.

Geology Group – First Wednesday

Wednesday, 4th May. "Gold and the Pacific Rim." Graeme Love.

Wednesday, 1st June. "Clay Resources of the Ballarat Region." Peter Atkinson.

(Continued on inside back cover)

The Victorian Naturalist

Volume 105, Number 2

March / April, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Photo: Mitchell River at Angus Vale, April 1988

A Note on the 'Tuan'

BY L. A. HERCUS*

Introduction

The time has obviously come for a closer examination of Aboriginal names of fauna and flora particularly in south-eastern Australia, as much of our knowledge comes from older published sources which were largely the work of amateurs. These amateurs must however not be underrated since without their contribution we would have no information at all for many areas. A brilliant beginning with the re-appraisal of Aboriginal names in the field of flora has been made by B. Gott (1983,1985). Work in the field of fauna has been conducted by I. Mansergh and L. Hercus (1981) and studies by L.E. Conole are in progress. Recently L.E. Conole has contributed valuable material on the identity of the Tuan (Canole 1987). He comes to the conclusion that 'Tuan is an inappropriate vernacular name for *Phascogale tapoatafa*': the term 'appears to have been used by Victorian Aborigines for small gliding possums'. While much of what L.E. Conole says is convincing there are still many problems involved in this point of view. I see these problems largely in the light of work done in the sixties on Aboriginal languages of the Victorian type. At that time there were still three languages for which it was possible to record extensive materials, Wembawemba, which was once spoken from the lower Loddon to Moulamein, Madimadi from the Balranald area of New South Wales, and Wergaia from the Lake Hindmarsh area (Hercus 1969/1986).

The story of Tuan

The new linguistic information helps to shed light on older published work. We can confirm for instance that Victorian-type languages did not have a phonemic distinction between voice and unvoiced consonants and that therefore, provided that some consistency is maintained, it is immaterial whether we write *p* or *b*, *t* or *d*, *k* or *g*, or for that matter 'Duan' or 'Tuan'. On the other hand there were two r sounds, a front tapped r and a retroflex ṛ. The new information goes beyond phonology in explaining older materials. An example of this can be seen with regard to the contribution to Brough Smyth (1878:53) by the Rev. Hagenauer. He gave a traditional Wergaia text which was so clearly transcribed that it can be analysed within the framework of what was learnt about Wergaia grammar and vocabulary in the sixties (Hercus 1986:94). The main Ancestor who figures in this story in Duan, i.e. the 'Tuan'. The text begins with the following sentence:

(In this rendering the first two lines represent an exact replica of Hagenauer's text and translation respectively. The third line, in italics, is a phonemic rendering of the text, while the fourth line is the corresponding analysis, based on the more recent linguistic evidence. A translation follows).

Duan	gapm	menjun	gumbarran
(name meaning squirrel)	tracked (a)	kangaroo	(and was) sleeping
Duan	*gabin*	*mindjun*	*gumberang*
Duan	follow-PAST	grey male kangaroo	sleeping about (PRESENT PARTICIPLE)
mellan	kitya	buroin.	
out	many a	night.	
malang	*gedja*	*burunj.*	
there-from ABLATIVE	many	night.	

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'Duan was following a male western grey kangaroo and was sleeping out many nights.'

In the continuation of this myth 'Weenbulain' the spider chased Tuan up a tree, then felled the tree and Tuan jumped and got up another tree, but the spider ultimately got him and killed him.

Throughout traditional Aboriginal mythology the behaviour of Ancestral beings bears a close resemblance to the behaviour of the associated animal species, thus ancestral Brushtail Possums always live in hollow trees, the Central Australian Ghost Bat, which can eat smaller bats, is a cannibalistic Ancestor, ancestral Root Grubs and Grass Grubs eat roots and grasses respectively. Carnivorous Ancestors go hunting. The size of the creatures that are being hunted is generally irrelevant because the Ancestors are in some sense human beings: in Arabana mythology for instance the Bull-Ant goes out hunting for Dingoes. Ancestral herbivores **never** go out hunting. Tuan in this story was doing just that, and what is more, he was walking along on the ground tracking his prey. This evidence would point strongly towards the interpretation of Tuan as the fiercly carnivorous *Phascogale tapoatafa*, rather than the gliders which are entirely arboreal and basically insectivorous but also eat plant exudates including sap and nectar.

This first sentence tells us more: 'melan', i.e. *malang* 'away from there', the ablative case of the demonstrative pronoun of distance, implies that Tuan was away from 'home', and hence that he had a home or nest. This however does not help us to differentiate between a phascogale and a glider.

As the Spider bites each tree and it falls to the ground we are told that Tuan got onto another tree until he was exhausted. The sentence reads as follows:

buiken	tyabapcrumen	ba	geka	yuaki	galk.
(the tree) falling	(Duan) jumped	and	(got) to	another	tree.
buigin djaga	*babgumin*	*ba*	*giga*	*njanjugi*	*galg.*
fall PAST ground-to ALLATIVE	jump PAST	and	this to ALLATIVE	other	tree.

babguna was a verb frequently used in Wergaia recordings meaning 'to jump'; a reduplicated form of the verb, *bab-babguna* means 'to jump around' and specifically refers to children playing. The normal Wergaia word for 'to fly' is *baiga* and 'to glide or float' is *djiba*. The use of a verb meaning 'to jump' rather than 'to glide' or 'to fly' points more towards a phascogale rather than a glider, but this again is not an absolutely compelling argument.

Tirhatuan

This was the name of the homestead of the Reverend James Clow, and it is suggested by Conole that 'it probably means place of the Tuan' (1987:105). There are linguistic reasons why this cannot be so. In English we would find unacceptable a compound noun of the type 'place-squirrel'. The situation is similar in the Aboriginal languages of South-Eastern and Central Australia. When nouns are compounded, a common noun in the genitive or dative function **has** to precede the noun that governs it, i.e. you have to say 'squirrel-place', 'rat-hole', 'possum-tree', 'river-bank' and so forth. This is a universal of all suffixing languages, Australian and otherwise. 'Tirha' can therefore only be a descriptive nominal or a verbal form: Tirhatuan could for instance mean 'many tuans' or 'seeing tuans'. We cannot even begin to hazard a guess, as placenames are unpredictable and often refer to quite unexpected mythological events. Typical of the many names of this kind is 'Burdi-durt' (Smyth 1878:205, which should probably read 'Bundi-durt') 'biting a star', this apparently refers to a mythological Dog jumping up and biting a falling star – but who could have guessed that?

There is a widespread idea that Aboriginal placenames are descriptive and contain

a word meaning 'place', such as 'place of red soil' or 'place of running water'. This false notion seems to have originated in some popular lists of placenames. Placenames are only rarely descriptive and there are two further important considerations:

a. Aboriginal languages generally do **not** have a word that corresponds closely to the semantic field of English 'place': they usually have a word that covers the meaning of 'ground', 'soil', 'area', 'country'. In Wembawemba, Werǧaia and neighbouring languages in Victoria this is *dja*. I do not know of any Victorian placename containing the word *dja*.
b. Aboriginal languages are highly specific in their references rather than general: each significant location has a name, usually with a mythological background. There was no need to point out that it was a 'place'. Of the thousands of placenames I have come across throughout years of work in this field, I can in fact think of only one solitary example of a name containing the word for 'place' or rather 'ground'. This *Mayarru-mitha* Mirra Mitta on the Birdsville track, which means 'rat-ground', *mayarru* being the Long-haired Rat *Rattus villosissimus* in the Ngamani language.

Clearly we cannot speculate about 'Tirhatuan'.

Tuan-tuan

In discussing a 'quite specific' description of *Acrobates pygmaeus* Conole quotes 'tuan-tuan' in Smyth (1878). The reference to a description which is indeed clearer than others must be to Smyth 1878:118, where he has published a 'Succinct Sketch of the Aboriginal Language' by William Thomas, the famous 'Guardian of Aborigines'. This sketch if fuller than most of the material published by Smyth and deals with the Melbourne area. The vocabulary included with this sketch has the following entry (p.124):

Flying squirrel (three kinds)	Eurun
Smaller kind	Ku-an-boo
Very diminutive	Tu-an-tu-an

Obligatory reduplication is found in many names that have an onomatopoeic origin, such as the Wembawemba word *wug-wug* meaning 'mopoke'. Optional reduplication is not uncommon in the names of small animals, lizards and birds: the names of large creatures such as eaglehawks or kangaroos are not reduplicated. The reason for this is that reduplication can at least in some south-eastern Australian languages convey a nuance of affection for something small, not to the same degree as English 'doggie-doggie' but along those lines. The reduplication does not make any difference as to species, it is just an optional feature (for roughly similar situation in Diyari, see Austin 1981:58).

The existence of the reduplicated form of the name 'tuan' is corroborated by Smyth's own notes (1876:271):

'A band made of the skin of a small flying squirrel (tuin-tuin) was fastened around the arm to give strength.'

However, without a taxonomist examining such an armband it is hard to regard the entry for 'tuan-tuan' as an absolutely positive identification of *Acrobates pygmaeus*.

Some further data

There are a number of problems connected with the original meaning of 'Tuan'. The most important primary source on Victorian languages by Mathews (1902:100), was not intended to give details of identification. Stone (1911) however does give us some help. He may have been an 'amateur', being the baker at Lake Boga, nevertheless his work is important for the information it contains on Wembawemba vocabulary, gathered from people whose knowledge was outstanding. He also had access to information on Werǧaia. One of the men who worked for him, carrying bags of flour, was Archibald Pepper from Lake Albacutya. Archibald Pepper's daughter the late Mrs Eleanor Jackson Stuart told us frequently 'Mr Stone used to come and visit us, usually on Sunday afternoon and spend a lot of time talking to Dad'. It was Archibald Pepper who told Mr Stone the Werǧaia

legend 'accounting for the formation of lakes Hindmarsh, Albacutya and Wonga and also Werringur'. This begins with the same episode about Tuan that was recorded by Hagenauer. He starts up with the sentence 'Ever so long ago a big black spider 'Werrinbool' saw a little squirrel "Doowan" which he chased up a tree'. Tuan again is visualised as walking on the ground, perhaps a pointer towards *Phascogale tapoatafa.*

A study of the lists in the compilation of Smyth and elsewhere of Aboriginal names for the smaller mammals makes sobering reading: there is no real descriptive material at all. There appears to be only one actual mention of the most obvious distinctive mark of a glider, the gliding membrane.

Y-eetik is given as 'flying squirrel for the Hampden-Heytesbury area by Robert Scott in Smyth (1878:185) with quite a specific mention of a 'wing', the entry reads:

Y-eetick	Flying squirrel (signifies a wing and bushy tail)
Buroot	Squirrel mouse (signifies little)

This has to be compared with Dawson (1881:1)

Squirrel, large flying	'Wieetich' 'Waeateeth'
Squirrel, small flying	'Tuugan', 'Iuukan'

'Y-eetick' is an attempt at the transcription of the same word as Dawson's 'Wieetich' (Dawson 1881:1) and the mention of a flying membrane or 'wing' makes this a certain indentification of a glider.

As regards 'tuan', it is so frequently listed as a 'flying squirrel' or in the company of larger 'flying squirrels' that Conole is fully justified in casting doubt on the hitherto accepted identification with *Phascogale tapoatafa.* Nowhere in the available literature however is there a really positive identification.

We may ask, why worry? What is in a name? From the Aboriginal point of view however there was a lot in a name. Aboriginal languages were highly specific in their identification of animals. This reflected a view of the world in which each creature mattered, not in the strictly conservationist sense, but as part of a general pattern: each species has its own character and place in the mythology (Stanner 1960:252). Because of the specific nature of terminology and classification in Australian languages it is highly unlikely that the same name 'tuan' could have designated two different species, *Acrobates pygmaeus* and *Petaurus breviceps* albeit in adjacent areas. It is still less likely that it could have designated even three species, if we include *Phascogale tapoatafa.* The problem needs further study.

My reaction to Conole's paper on the 'tuan' is a personal one. Over twenty years ago, when I was working with people who still had considerable knowledge of Victorian languages, I did ask about the word 'tuan'. Only one Werǥaia person vaguely recalled it. It was a creature of the forests and all the people concerned had been brought up on missions and stations. All I managed to record was what I thought to be the name of the Sugar Glider, which was *dirawal* in Madimadi, and Frank Wandin (Woiwuru from Healesville) gave me the name dadjer. The Madimadi word was recorded from the centenarian Madimadi speaker Jack Long (for his life history see Hercus and White 1971). He was then living at Pt Pearce in South Australia. L. Conole's article made me go through the relevant recording again.

Jack Long said: 'A squirrel you call dirawal. But there was another one. He was in the possum line but with a skin from his hand to his toe and he floats from tree to tree. I can't think of his name just now'. Obviously I was wrong in thinking that the 'squirrel' dirawal had to be a glider, the animal whose name Jack could not recall clearly was a glider.

Then some years later, during one of my last conversations with Jack Long we talked about animals again. He said: 'You know that little squirrel with a bushy tail? I used to see it around the Kulkyne when I was a boy. In Madimadi we call it *duangi'.*

I was delighted to hear this: the word duangi corresponded to 'duan' according to the usual pattern:

Wergaia *wudju*	'man'
dja	'ground'
Madimadi *wudungi*	'man'
dangi	'ground'

I thought I did know 'the little squirrel with the bushy tail' and asked no more about it. Was it the glider whose name he could not remember on a previous occasion? I missed what was undoubtedly the last opportunity of getting a first-hand identification of the 'tuan'.

Note

P.W. Menkhorst has provided the following comments on the fact that Jack Long's linguistic information is from the Kulkyne area of north-western Victoria:

Phascogale tapoatafa has not been recorded from north-western Victoria. The nearest records are over 225 km to the south-east 'in the vicinity of Mt. Hope' (Krefft 1866) and 230 km to the south near St. Arnaud. The species is not known to have occurred along the Murray River downstream of its confluence with the Goulburn River (data from Victorian Mammal Database, Wildlife Management Branch, Department of Conservation, Forests and Lands.)

By far the most important source of information on the mammalian fauna of north-western Victoria in the 19th century is the results of the Blandowski expedition to the junction of the Murray and Darling Rivers in 1856-57. This expedition was based near where Mildura is today for almost 12 months and during this time Krefft obtained specimens of 38 mammalian species from the surrounding area. *Phascogale tapoatafa* was not among them and Krefft (1864) stated that *P. tapoatafa* was 'certainly not known to the Aborigines of the Murray and Darling' (see Wakefield 1966). However, Krefft did record the other, smaller phascogale *P. calura* which is similarly scansorial and carnivorous. Krefft (1866) recorded the aboriginal name for this species as 'Kultarr', a name he also ascribed to *Antechinomys laniger*, although claiming confusion amongst his aboriginal informants.

Significantly, Krefft did not record *Petaurus breviceps* either, and it is not known to occur along the Murray downstream of Gunbower State Forest some 230 km to the south-east. Krefft was very specific about this, stating that he 'made many enquries of the Natives about the genus *Petaurus* and found that these animals are not known to them'. Recent surveys have however shown that *Acrobates pygmaeus* occurs in the Kulkyne area and further downstream, although not recorded by Krefft. Thus the mystery remains unsolved!

Acknowledgements

I am indebted to Ian Mansergh and Peter Menkhorst of the Arthur Rylah Institute for Environmental Research for comments and corrections.

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Westringia lucida Boivin (Lamiaceae): A New Species for Victoria

By Adrian Pyrke* and John Westaway*

Introduction

Westringia is a genus of shrubs in the mint family, Lamiaceae (Labiatae). The genus is endemic to Australia and Lord Howe Island (Curtis, 1967), with some 26 species currently recognised and six species previously considered indigenous to Victoria. The first and only known Victorian record of *Westringia lucida* (Shining Westringia) is reported here.

Description

A low dense shrub up to three metres in diameter and less than 0.5 m high, with decumbent stems. Leaves shortly petiolate in whorls of 3, elliptic, 8-12 mm long x 6-8 mm wide, thickish, blunt at apex, margins flat, midrib obscure, surface glabrous and shining.

Flowers axillary and subsessile. Calyx broadly conical, 6.5-7.0 mm long, shining, glabrous or almost so, tube 4.5 mm long, lobes 5, triangular 2.0-2.5 mm long. Corolla funnel shaped, white with reddish spots, pubescent.

Each flower matures up to four ovoid nutlets, 2.0-2.5 mm long, brown with prominent reticulate venation.

Key

W. lucida can be distinguished from other Victorian species by the relatively large, broad leaves which are flat at the margins. The key to Victorian *Westringias* in Willis (1973) can be modified as follows to include *Westringia lucida*: p586 after line 30 (i.e. at the end of the *Westringia* key), add a third option to lead 5.

– Leaves with midrib not prominent, lamina flat, elliptic, blunt, thickish, shiny, 8-12 mm long, 6-8 mm wide, (summit region of Mt. Arthur near Mt. Bogong).

Rm 106, No. 2 Treasury Place, Melbourne, 3000.

Locality and Habitat

In January 1987, a population of *Westringia lucida* was found growing on the summit region of Mt. Arthur, 6 km south-west of Mt. Bogong, at altitudes above 1600 m. More than 100 plants were found scattered over an area of approximately 13 hectares. Further investigation might locate this species in similar habitat in The Grey Hills nearby.

Westringia lucida was found growing on all aspects, often on dry, rocky sites. The underlying parent rock is a metamorphic, Ordovician gneiss. The summit of Mr. Arthur has a mosaic of treeless patches and patches with *Eucalytus pauciflora* (Snow Gum). The treeless patches are either shrubby or grassy, while the Snow Gum Woodland/Open-forest patches mostly have a shrubby understorey. *Westringia lucida* predominantly occurs in treeless patches, but also occasionally under Snow Gum canopy.

On Mt. Arthur, *W. lucida* forms discrete clumps surrounded by other shrub species. Associated species include *Bossiaea foliosa, Brachycome rigidula, Carex breviculmis, Celmisia asteliifolia, Craspedia glauca* spp. agg., *Danthonia nudiflora, Grevillea australis, Olearia frostii, Oxylobium alpestre, Poa hothamensis, Rumex acetosella* spp. agg. and *Trisetum spicatum. Westringia lucida* was in full flower on 10th January 1987, but had completely finished flowering when the site was revisited on 13th February 1987.

Distribution and Conservation Status

Prior to this record, *Westringia lucida* was only known from the Koscuisko region of New South Wales and Mt. Scabby in the Australian Capital Territory (Leigh *et al.*, 1981; National Herbarium of Victoria records). Leigh *et al.* (1981) describe this species as having a range of less than 100

km and vulnerable, that is, at risk through continued depletion. This new record obviously extends the range beyond 100 km, but the species must still be considered vulnerable. Certainly this small Victorian population adds little to the security of the species as a whole.

A current grazing licence covers this *Westringia lucida* site. However, it is believed that cattle rarely venture onto the summit region of Mt. Arthur, because of inadequate water. Further observation of this population over the next few years, by interested naturalists, will determine whether a cattle disturbance problem exists. The other conservation problem is fire. How much and when? This is a perennial question faced by land managers (in this case C.F. & L. and S.E.C.) upon whom falls the responsibility to conserve and foster rare or threatened native plants. It is intended that this article may lead to recognition of further populations of *Westringia lucida* and consequently an understanding of its ecology so that management does indeed allow this species to flourish.

Acknowledgements

We wish to thank Dr. B. Conn (N.S.W. Herbarium) and Mr. D. Albrecht (Melbourne Herbarium) for confirming the indentification of our material, Mr. N. Walsh (Melbourne Herbarium) for comment on the text.

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100 Years Ago

New Course at Melbourne University: the Degree in Natural Science

The year has been signalised at the Melbourne University by great developments. Students have been working through the first year of a scientific course for the newly-established Degree in Natural Science. One of the most noteworthy features of this course is that, after his first year of more general work, a student is required to specialise, to devote himself to one only of the four natural groups of sciences – to physics, to chemistry, to biology, or to geology. We may now look forward, then, to having amongst us men well and thoroughly trained in these sciences, who shall be able to speak with the authority of first hand knowledge, and who, by their presence and influence, will be able to communicate to the University and to the commonwealth more – much more – of general scientific culture than could possibly be the case if all acquired the same smattering of some of the elementary, but of none of the advanced, principles and methods of all the sciences. Most satisfactory is the provision already made for practical work. Under the skilled guidance of Dr. Masson, a well equipped primary chemical laboratory has been erected, and is now in full working order. There are signs that the great difficulties of furnishing adequately a physical laboratory will be fairly grappled with.

We are naturally most interested in the School of Biology. A new chair was created at the close of last year, and has been filled by the appointment of Professor W. Baldwin Spencer, of Oxford who has shown himself an enthusiastic worker in all departments of his subject since his arrival in the colony. A first instalment of the Biological Laboratories is approaching completion, and is expected to be in readiness for the use of students in a few weeks.

From the Address by the President, A.H.S. Lucas, Victorian Nat. Vol.V., No.I, May 1888.

A Survey of a Rare Callistemon Thicket Community in East Gippsland, Victoria.

By K. M. Regan*, P. J. Bolitho*†, R. Adams* and D. Simmons*

Introduction

The Coast Range Forest Block near Bendoc in East Gippsland has a diverse and unique flora which is little known. The Land Conservation Council, Victoria (L.C.C., 1977) has stressed the importance of the Coast Range Block in terms of its conservation value and habitat for fauna. The Land Conservation Council has recently compiled the Review of the Proposed Recommendations for East Gippsland (1986) and further information was sought to determine the conservation value of those parts of the Coast Range Forest Block which might be included in the then proposed Errinundra National Park. The Errinundra Plateau National Park has now been declared, but excludes the Coast Range Forest Block (L.C.C., 1986).

In a floristic study of the Coast Range Forest Block, Carr *et al.* (1984) recognized 8 communities. The Callistemon Thicket was described from a site on Swede Creek in the west of the study area. Carr *et al.* (1984) describe this community as a discrete and apparently rare community, whose distribution is likely to be limited by moisture availability and suitable soils. The Callistemon Thicket is considered to be botanically significant, and contains at least three significant plant species. *Callistemon* spp. aff. *pallidus* is the dominant species in this community. It appears to be an undescribed taxon, and its conservation status has not been established due to previous confusion with *C. pallidus* (Carr *et al.*, 1984). The two other significant species noted are *Blechnum pennamarina,* which is generally restricted in distribution in East Gippsland with the locality at Swede Creek being the most easterly recorded, and *Poa clivicola,* a species common in this Block but generally regarded as rare elsewhere (Carr *et al.*, 1984).

The Callistemon Thicket community is rare, both in the Coast Range Forest Block and in Victoria. Apart from its botanical interest, this bottle-brush may be an important seasonal food-source for nectar-eating animals, especially honey-eaters. The Callistemon Thicket is zoologically significant as the site also has a high bird diversity, and was the only area in the Coast Range Forest Block where *Coracina tenuirostris* (cicada bird) was observed. No mammal survey has previously been undertaken in this community.

The Callistemon Thicket is surrounded by Montane Sclerophyll Woodland which is also a rare vegetation community in Victoria (Carr *et al.*, 1984). This community was once widespread in the Bendoc area, but has been largely cleared for grazing, and the small remaining areas now have significant conservation value. This paper reports on a survey of the soils, vegetation and mammals in this rare and significant plant community, undertaken on August 24-28 1986.

The Study Site

The study site was situated about 25km. east of Bendoc, along Swede Creek. It includes the Callistemon Thicket community and some surrounding Montane Sclerophyll Woodland. The Callistemon Thicket community covers about 1ha. scattered over a distance of about 100m along Swede Creek, and is surrounded by about 32ha. of sclerophyll woodland. Patches of *Callistemon* were about 10-20 x 15-40m. The Callistemon Thicket community is dominated by *C.* spp. aff. *pallidus* which forms an unusually well developed closed stand about 5m high. The vegetation is described by Carr *et al.* (1984) as closed scrub, with the ground layer being dominated by dense *Gahnia sieberiana.* The surrounding Montane

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Sclerophyll Woodland vegetation is dominated by *Eucalyptus obliqua* and *E. dives*, with a moderately dense shrub layer and a well developed ground layer containing a high diversity of species. Some characteristic understorey plants include *Gonocarpus tetragynus, Leucopogon lanceolatus, Olearia erubescens, Coprosma quadrifida, Lomandra longifolia* and *Poa clivicola.*

The geology of the area is generally late Ordivician sediments, which include sandstones, mudstones and shales, though intrusion by younger granites does occur. The soils developed by these parent rocks are friable red and brown gradational loams which often have rock fragments through their horizons (L.C.C., 1986). The climate of East Gippsland has a greater affinity with that of coastal southern New South Wales than with the rest of Victoria (L.C.C., 1974). The rainfall is fairly evenly distrbuted over the year in most areas, but is markedly influenced by topography. The average annual rainfall at Bendoc is 712mm. Frosts can occur at almost any time of the year at Bendoc and winter snow is common above 600m. The altitude of the study site is 840m.

Methods

For the soil analysis, 6 soil samples were collected from each of the two communities using a 75mm diameter hand auger. Organic matter, colour, pH, texture and structure were determined.

Vegetation Survey

All vascular plant species in three 10 x 10m quadrats in both the Callistemon Thicket and in the surrounding Montane Sclerophyll Woodland were assigned relative cover/abundance values as in Gullan (1978), using the cover ratings +: cover < 5%, few individuals; 1 : cover < 5%, any number of individuals; 2 : cover 5 – 20%, any number of individuals; 3 : cover 20 – 50%, any number of individuals; 4 : cover 50 – 75%, any number of individuals; 5 : cover 75 – 100%, any number of individuals. Nomenclature follows Carr *et al.* (1984). Many orchids are recorded for the area by Carr *et al.* (1984), but few were observed in the present study as many orchid species are visible only at particular times of the year.

Mammal Survey

A mammal survey was carried out in the Callistemon Thicket and adjacent Montane Sclerophyll Woodland. Direct (trapping and spotlighting) and indirect methods (predator scat analysis, diggings, tracks) were used to determine the identity of mammals utilizing the study area.

Both sites were trapped for three consecutive nights in August 1986. Elliott type A folding aluminium traps (33 x 10 x 9cm), baited with a mixture of peanut butter, rolled oats and honey were set at dusk and cleared soon after dawn the next day. Traps were distributed evenly over the study area, and also located to maximize capture, such as near runways. Gordon wire mesh traps (36 x 20 x 16cm) were also set for three consecutive nights.

Spotlighting was carried out on 26 and 27 August on foot between dusk and 2200 hrs with portable spotlights.

Four predator scats (2 fox, 2 dog) were collected in the immediate area, analyzed and the prey remains identified using the techniques outlined in Brunner and Coman (1974) and Brunner and Wallis (1986). Direct observations of mammals and their indirect signs (Triggs, 1984) were also noted at the site.

Results and Discussion

Soils

Soils within the Callistemon Thickets were of duplex soil type with a sharp transition between a dark grey (10 YR 3/1) sandy clay loam topsoil with pH 5.0-5.8 to a depth of about 10cm, to a grey (10 YR 5/1) medium to heavy clay subsoil with slightly acidic pH between 5.1 and 6.0. Soils had yellow iron oxide mottling indicating waterlogged conditions. The slopes in the thickets were 0-5%, and the water table was at or near the surface. Streamflow is perennial during favourable years (Carr *et al.*, 1984).

Organic matter content was 4.6-6.2%. Some quartz and charcoal was observed in the profile.

Soils in the surrounding Montane Sclerophyll Woodland were of a gradational soil type with reddish brown (5 YR 4/3) light clay loam with pH 4.7 to about 10cm, grading to a red (5 YR 4/8) light clay with pH 5.2. Slopes were 5 – 10%, and organic matter content was 7.1%.

There is a clear difference between the duplex soils under the Callistemon Thicket and the gradational soils under the surrounding woodland. A heavy clay subsoil can restrict permeability throughout the subsoil profile. The structure of the closed scrub community further affects moisture by restricting light penetration and possibly reducing evapotranspiration. The physical characteristics of these duplex soils with their high water holding capacity, combined with the relatively flat topography and poor drainage results in the soils remaining permanently wet, and the *Callistemon* is likely to be in a continuously waterlogged environment.

Vegetation

The species composition of the Callistemon Thicket and the surrounding Montane Sclerophyll Woodland has many similarities. Sixteen species (62%) were widespread and found in both the Callistemon Thicket and the surrounding forest, four species (15%) were found only in the Callistemon Thicket, and 6 species (23%) were confined to the surrounding woodland (Table 1). The main species which is restricted in its distribution is *C.* spp. aff. *pallidus*, which dominates the closed scrub community. It was suggested by Carr *et al.* (1984) that this discrete and rare community is probably limited in its distribution by moisture availability and suitable soils, while Costin (1954) suggests that shelter and soil moisture are the main limiting factors. *C. pallidus* appears to have a narrow envionmental tolerance, and does not occur on aspects exposed to more dessicating influences.

Fire history of the site may be an important factor affecting the distribution of *C.* spp. aff. *pallidus.* There were no seedlings of *Callistemon,* and the numerous capsules on the mature plants were tightly closed. In the surrounding sclerophyll woodland there was a large amount of litter comprised of leaves, bark, etc on the ground and approximately 90% of acacias were dead. No *Acacia* seedlings were observed. The absence of recent fire scars, the large amount of litter on the forest floor, the large number of dead acacias, and lack of *Acacia* seedlings suggests a long interval since the last fire. This hypothesis is supported by the numerous unopened capsules on the *Callistemon* and the lack of any seedling regeneration. *Callistemon* falls into a group of plants where seed is held in the capsule for a long period of time, and seed is only released following

Table 1: Location and average cover/abundance values of species in three quadrats in both the Callistemon Thicket and in the surrounding Montane Sclerophyll Woodland at Swede Creek, East Gippsland. Cover/abundance values are + : cover < 5%, few individuals; 1 : cover < 5%, any number of individuals; 2 : cover 5-20%; 3 : cover 20-50%; 4 : cover 50-70%; 5 : cover 75-100%.

Species	Surrounding Woodland	Callistemon Thicket
Callistemon spp.aff.pallidus		5
Lomandra longifolia		2
Drymophila cyanocarpa		1
Helichrysum scorpioides		1
Eucalyptus radiata	2	1
Eucalyptus viminalis	1	1
Lagenifera stipitata	1	1
Olearia erubescens	1	1
Dianella revoluta	1	1
Acacia dealbata	2	2
Pteridium esculentum	2	1
Blechnum pennamarina	+	2
Poa tenera	2	1
Poa chvicola	1	1
Viola hederacea	2	1
Gahnia sieberiana	1	+
Gonocarpus tetragynus	1	+
Coprosma quadrifida	1	+
Acacia mucronata	1	+
Acacia melanoxylon	1	+
Eucalyptus obliqua	2	
Eucalyptus dives	2	
Lomatia ilicifolia	1	
Leucopogon lanceolatus	1	
Poranthera microphylla	1	
Epacris impressa	1	

Table 2: Mammals detected in Callistemon Thicket and surrounding Montane Sclerophyll Woodland at Swede Creek, East Gippsland, and the method by which they were detected (T = trapping, S = spotlighting, P = predator scat analysis, O = observations of diggings, D = scats). *Wallabia* detected only in predator scats, and location of origin unknown.

Mammal	Surrounding Woodland	Callistemon Thicket	General Area
Dasyuridae			
Antechinus stuartii		T, P	
Phalangeridae			
Trichosurus caninus	S		
Petauridae			
Petaurus australis	S, P		
Petauroides volans	S, P		
Peramelidae			
Perameles nasuta	P, O		
Muridae			
Rattus fuscipes		T, P	
Canidae			
Canis familiaris	D		
Vulpes vulpes	D		
Macropodidae			
Wallabia bicolor			P

fire when the capsules are opened (Gill, 1975).

Mammals

Table 2 summarizes the mammal species surveyed and detection method.

Only two species of small mammal were trapped, the dasyurid marsupial *Antechinus stuartii* (Brown Antechinus) and the murid rodent *Rattus fuscipes* (Bush Rat). All mammals were trapped in the Callistemon Thicket; no mammals were trapped in the adjoining woodland (Table 3). In the Callistemon Thicket *R. fuscipes* was the dominant mammal trapped at a ratio 5:1 *R. fuscipes : A. stuartii* (Table 3). Montane Sclerophyll Woodland is not a favoured habitat of *R. fuscipes* and Carr *et al.* (1984) also report that no *R. fuscipes* were trapped in Montane Sclerophyll Woodland, in spite of this species being common in the Coast Range Forest Block.

Table 3: Results from trapping in the Callistemon Thicket and surrounding Montane Sclerophyll Woodland at Swede Creek, East Gippsland.

Mammal Species	Surrounding Woodland	Callistemon Thicket
R. fuscipes		
male	0	9
female	0	3
A. stuartii		
male	0	1
female	0	1
unknown	0	1
Total	0	15
Trap nights	38	115
Trap success rate	0	7.8%

Trapping success rate in the Callistemon Thicket was 7.8% compared to 1.6% reported in Carr *et al.* (1984) for the Coast Range Block. Differences in trapping success may be due to trap placement, as *R. fuscipes* is trapped with high frequency where there are runways and good vegetation cover (Stewart, 1979). Runways were noted in the periphery of the *Callistemon* sites, particularly within the *Lomandra longifolia* fringing the community. Trapping near these runways indicated they were probably used by *R. fuscipes.*

Trapping data of this study are limited, but suggest the importance of small areas of favourable habitat, such as the Callistemon Thicket, within large areas of less favourable habitat. *Callistemon* may be an important seasonal food source for nectar-eating animals (Carr *et al.,* 1984), however information on flowering times for this taxon is lacking.

Table 4: Results from 9 hours of spotlighting over three nights. All sightings were in Montane Sclerophyll Woodland adjacent to the Callistemon Thicket.

Species	Total Number of Sightings
Petaurus australis	1
Petauroides volans	7
Trichosurus caninus	7

Three arboreal mammal species were observed in the Montane Sclerophyll Woodland; *Petaurus australis* (Yellow-bellied Glider), *Petauroides volans* (Greater glider) and *Trichosurus caninus* (Mountain Brushtail Possum). No arboreal mammals were oberved in the Callistemon Thicket (Table 4). Spotlighting observations were lower than recorded by Carr *et al.* (1984), but species like *P. australis* are highly mobile, and differences may be due to seasonal movement in response to food requirements (Henry and Craig, 1984). *P. volans* and *T. caninus* were the most numerous mammals, and both were observed in the Montane Sclerophyll Woodland dominated by *Eucalyptus obliqua* and *E. dives,* but not in the Callistemon Thicket. The survey results for this woodland are consistent with those of Carr *et al.* (1984).

Six mammalian prey species were detected from four carnivore scats (Table 2). A series of small conical digging pits clustered in one area on the edge of a *Lomandra longifolia* patch in the Sclerophyll Woodland community were observed, and are likely to be due to *Perameles nasuta* (Long-nosed Bandicoot), whose presence in the area was confirmed by predator scat analysis.

Conclusion

There is a clear relationship between soil type, and the presence of *Callistemon. Callistemon* distribution appears to be limited to heavy clay soils on flat sites where soils are likely to remain continuously waterlogged. Seven species of native mammals were recorded at the study site. The three arboreal mammals were recorded in the Montane Sclerophyll Woodland community, but not in the Callistemon Thicket.

The Callistemon Thicket community is regarded as significant for vegetation and birds by Carr *et al.* (1984), and this survey has revealed that is is utilized by at least three species of small ground-dwelling mammal. These small mammals have a preference for particular vegetation communities; small patches like the Callistemon Thicket are thus important in providing islands of suitable habitat to maintain populations of these species within the more widespread but less utilized communities. The Coast Range Forest Block was not included in any reserve, and is available for sawlog harvesting. Small areas such as the Callistemon Thicket with relatively high densities of small mammals compared to the adjacent forest, may be important sources of new recruits into areas of nil or low density of small mammals following disturbance, such as fire or logging operations (Press, 1986). Thus the Callistemon Thicket community has significant botanical and zoological value, and should be conserved.

Acknowledgements

We wish to thank Jim Adams, Department of Conservation Forests and Lands, Bendoc, for his assistance in locating the site, and Hans Brunner, Department of Conservation Forests and Lands for predator scat analysis.

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100 Years Ago
Wilson's Promontory to Become a National Park?

At the August meeting Mr. Gregory brought before the Club the desirability of at once taking steps to secure the permanent reservation of Wilson's Promontory as a national park. The motion he introduced was carried unanimously, and it was decided to ask the other scientific societies of Victoria to unite in making strong representations to the Ministers of Lands and Customs on the subject. Accordingly, after much careful consideration had been given to the question by these bodies, a deputation, representing the Royal Society, the Geographical Society, and the Academy of Arts, as well as our Club, waited on the Minister of Lands, and pointed out to him the peculiar advantages of the Promontory for the purpose specified, its natural and effective boundaries, its variety of scenery, its future accessibility, the absence of vested interests, and the utility of part as a forest (kauri) reserve. The deputation was well received, and we are hopeful that Victoria will follow, in this respect, the good examples set by the United States of America, by New South Wales, and by New Zealand, and will preserve this wild locality as a recreation ground for the colony.

From the Address by the President, A.H.S. Lucas, Victorian Nat. Vol.V., No.I, May 1888.

Preliminary Notice
'Victoria's Birds – Past, Present and Future,
Vorg Conference
Melbourne, 21st-23rd October, 1988

The Victorian Ornithological Research Group will be holding a Conference in Mebourne over the weekend 21st-23rd October, 1988, on the theme "Victoria's Birds – Past, Present and Future."

As well as looking at the historical aspects of bird studies in Victoria, it is hoped to explore the areas of research which are likely to be most attractive to part-time workers in the future.

All interested persons are invited to attend the Conference. It is hoped that further details will appear in a later issue of this journal; in any case they may be obtained from the address below.

VORG CONFERENCE SECRETARIAT,
P.O. BOX 203,
SOUTH MELBOURNE, 3205.

Gordon Cameron
Secretary

Koalas In Tea-tree

By Keely Ough,* K. A. Handasyde,* R. W. Martin,* and A. K. Lee*

Although emphasis has been placed upon the dietary dependence of the koala, *Phascolarctos cinereus*, on the foliage of certain species of *Eucalyptus*, it has occasionally been observed to feed on foliage from other genera. For example, koalas have been observed feeding on native kapok (*Bombax malabrica;* Degabriele 1973), pink box (*Tristania conferta),* and swamp box (*Tristania suaveolens;* Pearce and Eberhard 1978), and monterey pine (*Pinus radiata;* Lithgow 1982). Here we describe some observations which clarify the contribution that foliage from other genera may make to the diet.

In November 1986, we captured six adult female koalas in manna gum *(E. viminalis)* on French Island and released them in a woodland of the same species at the northern end of nearby Chinaman Island. Within a week all animals had dispersed from the release site and two weeks after release, four of the animals were found in thickets of coastal tea-tree *(Leptospermum leavigatum)* or swamp paperbark *(Melaleuca ericifolia)* towards the centre and south end of the island. On subsequent visits to the island the koalas were found in either coastal tea-tree, swamp paperbark or manna gum (Table 1). None of the animals was consistently found in a single species, although female R/B occurred on all but two occasions in coastal tea-tree. Some of these animals settled towards the southern end of the island where the vegetation comprised an old aged stand of coastal tea-tree through which were scattered a few manna gums. This stand was separated from the shore by a narrow stand of swamp paperbark.

Superficial inspection of faecal pellets from these animals suggested that all were feeding on coastal tea-tree or paperbark, as well as manna gum. We collected faecal pellets from the animals, or from the ground beneath the tree they occupied, on four separate occasions at roughly weekly intervals between February 18 and March 25, 1987. Whenever possible we examined five pellets for each koala on each occasion. Faecal pellets were broken apart by lightly crusing in water with mortar and pestle, then bleached in sodium hypochlorite ("White King") for 4-6 h, washed in water and stained with gentian violet. Subsamples mounted in 60 percent corn syrup (Karo) were examined under 40X magnification and the cuticle fragments identified. Reference cuticles were prepared from fresh leaves by the method described above, and also by digesting pieces of leaf in hot concentrated nitric acid until only cuticles remained. Frequencies of the different plant species were not quantified, but often fragments attributable to one species were predominant and this was noted.

Table 1: Tree Use by Koalas Released on Chinaman Island (E = *Eucalyptus viminalis*, Ex = *Exocarpos*, L = *Leptospermum laevigatum*, M = *Melaleuca ericifolia*, Mn = Mangrove)

	KOALAS					
Dates	R/L	R/G	R/P	R/R	R/B	R/Y
19.11.86	E	E	E	E	E	E
26.11.86	E	E	E	Ex		E
3.12.86	M	E	E	M	L	L
10.12.86	E	E	M	E		E
18.12.86	L	E	M	L	L	Ex
24.12.86	L	E	E	L	L	E
31.12.86	M	E	M	M	L	M
7.01.87	L	E	E	L	L	E
14.01.87	L	E			L	M
22.01.87	M	E	E	L	L	M
28.01.87	M	L	M	L	L	M
4.02.87	L	E	E	M	E	L
11.02.87	M	E	E	E	L	E
18.02.87	M	L	M	L	L	L
25.02.87	E	E	E	E	L	M
4.03.87	M	M	M	L	L	E
11.03.87	E	E				E
25.03.87	Mn	E	E	L	L	E
% OCCURRENCE IN						
E. viminalis	28	83	63	25	13	50
L. laevigatum	28	11	37	50	87	17
M. ericifolia	39	6	0	19	0	28

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Table 2: Composition of Faecal Pellets of Koalas on Chinaman Island
Symbols as in Table 1. "E〉M" for example, represents a pellet composition of at least 75% eucalypt and less than 25% *Melaleuca;* and "E–L" a proportional representation between 75:25 and 25:75.

	KOALA					
Dates	R/L	R/G	R/P	R/R	R/B	R/Y
18.02.87	E〉M	E〉L〉M	E〉M	E–L〉M	E=L	E–L
25.02.87	E〉M	E〉M	E	E/L	E L	
4.03.87	E	E=L〉M	E	L〉E	E=L	E
25.03.87	E	E〉L	E	E=L	E〉L	E〉L

All faecal pellets examined (N=101) contained fragments of manna gum (Table 2), and in many instances this was the only species detected (38 percent of samples), or predominant species (27 percent). Coastal tea-tree was detected in 52 percent of the pellets, was predominant in 4 percent of the pellets, and occurred in roughly equal proportions with manna gum in another 31 percent of samples. Swamp paperbark was detected in 15 percent of samples, but was never predominant. These and other observations of the diet of koalas (eg. Hindell and Lee, 1988) suggest that koalas are less fastidious in their choice of food species than previously thought. Nevertheless they confirm that, within a geographic region, the foliage of one or two species of *Eucalyptus* are predominant and consistent components of the diet.

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Naturalist Review

By R. L. Wallis

Koala, Australia's Endearing Marsupial

Edited by Leonard Cronin
Reed Books, Frenchs Forest, N.S.W.,
ISBN 0 7301 0158 4. Rrp $24.95

There seems to be a gap in the literature pertaining to the natural history of our native mammals; on the one hand there exists a plethora of "coffee-table" photographic works which are very light on information, and at the other extreme are those written for authorities or for students of mammalogy – the truly scientific literature. It is thus pleasing to see scientists who have an expert knowledge on the biology and natural history of mammals attempting to fill the void – that is, provide an interesting, informative and accurate account of their research to an intelligent lay audience. Thus we have seen Archer's **Kangaroos**, Russell's **Spotlight On Possums** and even Strahan's **Complete Book of Australian Mammals.** Now a book has been written for the same readership on Koalas.

The editor of **Koala** has done a fine job in having five experts write chapters on different aspects of Koala biology. Differences in style and even opinions can often detract from a compiled volume – yet this is not apparent in this book. Steve Cork starts off with two chapters – one an introduction to the Marsupials in which he gives an historical account of their discovery by Europeans as well as details on the characteristics and classification of marsupials, and the other on Form and Function in the Koala. This chapter discusses the structural and physiological adaptation of Koalas to their environment – temperature, energy and water relations, teeth and diet, and life cycle characteristics. This is an excellent piece of work – one of its features is the dispelling of many myths about Koalas (e.g. that by fermenting eucalyptus leaves in the caecum Koalas are either permanently drunk or else high on drugs – hence their sleepy disposition!).

Malcolm Smith's chapter on Behaviour and Ecology is most entertaining. Take, for instance, his description of a male's bellow:

> "Typically, a male wakes up, points his head to the sky, and inhales deeply, producing a long, tremulous "snoring" sound. Suddenly the air is expelled with a noise like a belch, his diaphragm contracts sharply, his head is jerked even further back, and another series of "snores" and "belches" follows. As the crescendo rises his nostrils flare, his voicebox heaves upwards, his cheeks are sucked inwards, and his tongue protrudes. The effect is thunderous."

Mike Archer and Sue Hand then have a chapter on Evolutionary Considerations in which they discuss the phylogeny of the Koala sub-order (Phascolarctomorpha) including some of their exciting finds at Riversleigh, northwestern Queensland. Their discussion on how palaeontologists can predict a species' life style and natural history from its skeletal remains is most instructive. Whenever Michael Archer writes, the reader cannot escape his infectious enthusiasm and the excitement of discovery which seems to accompany his research. This chapter is no exception. What also comes through in this chapter is that Koalas were a once diverse group – many species lived – sometimes together – in habitats they no longer frequent today (e.g. rainforests).

> "The modern situation where only one kind of Koala survives in what is a relatively limited variety of environments should give us pause for concern. Is it possible that, like thylacinids, the Koala lineage is nearing the end of its run?"

Finally Stephen Phillips describes the aboriginal legends about Koalas and gives an account of Europeans' treatment of the species since settlement. He describes how Koalas nearly became extinct through overclearing, disease and shooting but how a changed attitude in the 1920's saw measures implemented to save the species. In 1927 the last of Australia's infamous open seasons on Koalas was held in Queensland where 587,738 skins were sold, netting the State Government 1900 pounds at the time. Such was the extent of the public outrage at this massacre of a threatened species that the Queensland Government set this sum aside for a trust for "protection and propagation of native fauna!"

This book is well presented with many colour plates, sketches and distribution maps. A feature is the use of highlight boxes typically found in

New Scientist and many American texts; topics such as "Scent Marking", "Dealing With Toxic Compounds in Gum Leaves", "Reproductive Tracts" and some of the myths are dealt with in half page (or longer) highlighted boxes.

Some minor deficiences in the book do exist. The dust cover descriptions of the authors is riddled with errors. The bibliography also has errors and inconsistencies in it which more careful editing should have rectified. Some of the photographs seem out of place in a work of this kind and surely a better title could have been found!

Nevertheless this book should provide naturalists who have a basic knowledge of biology and some of its jargon (especially in terms of say physiology and geological time spans) a most useful and interesting account of a thoroughly fascinating marsupial.

Naturalist Review

BY G. W. CARR

Victorian Orchids in Habitat

BY M. E. DACY

Published by the author (1987), pp xxii, 197. $37.00.

In recent years there has been an unprecedented interest in the Victorian orchid flora – both among amateur and professional enthusiasts. No group of plants is so widely studied or so jealously sought in its native habitats. As noted by others, many people, especially naturalists are first introduced to botany via an attraction to those inordinately attractive and interesting plants.

In Australia a great deal of new information on the taxonomy, biology, ecology, distribution, conservation and cultivation has been accumulating. It indicates that the orchid flora of southern temperate Australia, so far as the terrestrial species are concerned, is by world standards exceedingly rich and (per unit area) is only rivalled by the terrestrial orchid flora of northern Africa, specifically the Cape Floral Kingdom.

Against this background of dynamically changing state of orchidological knowledge and the relative dearth of recent orchid literature available to Victorian enthusiasts, this new book **Victorian Orchids in Habitat** by M. E. Dacy, is reviewed.

The stated purpose of the book is "the identification of Victorian orchids." It is primarily a pictorial guide with descriptions of species and line drawings of diagnostic features, particularly the labellum and column. The author describes the purpose of the book in the preface and alludes to her methods of study without, however, really telling the reader precisely how this was accomplished.

A 'key' to orchid genera in Victoria follows though no more than a simplified list of features of genera arranged after the fashion of a key originally the work of Winifred Waddell, it has been taken from **Wildflowers of Victoria** by Galbraith (1967). Not only is it too simplistic to be useful it is in places inaccurate and erroneous e.g. we are led to believe that the leafless saprophyte *Cryptostylis hunteriana* has "one or two large, thick, erect leaves".

In the introduction the author discusses the family Orchidaceae giving details of its characteristics and size and its distribution and biogeography in Australia and Victoria. The information is sometimes incomplete and dated and mostly unreferenced so that the reader would be unable to persue particular aspects. Then follows a run-down on what is called the "life history of a flowering plant", actually narrowed to a discourse on floral reproductive biology. Vegetative aspects of orchids, as relevent as any information, are ignored entirely. The parts of an orchid flower are then described under individual headings. In this section, particularly that on resupination, exotic genera stray in and out of the text. Eight of the line drawings illustrating 11 types of resupination or non-resupination are of exotic genera but only a minute proportion of the intended audience would know what a *Satyrium* or *Ceratandra* is. Though clearly unoriginal, the source of this information in unacknowledged.

The main body of the test is devoted to alphabetically arranged descriptions of orchid species in 27 genera. The book purports to be a more-or-less exhaustive account of the orchid flora, but according to my recent enumeration (prepared for the National Herbarium of Victoria's, listing of the State flora) there are about 205 species in Victoria as well as numerous hybrids while the author of **Victorian Orchids in Habitat** acknowledges only 165 species. This represents an omission of about 20% of the orchid flora!

Of these omitted taxa, many are undescribed, comparatively recently described or have been recently added to the Victorian flora. Relatively little of this information is so esoteric that it is known to only a few taxonomists; much has been reported in literature apparently unknown to the author. Dacy however, could not have included some recently published species (e.g. *Pterostylis*) at least by name.

The author seems unaware of the progress of taxonomy, not to mention contemporary species' concepts, much modified and revised in the light of recent research. She takes as her source the *Handbook* of Willis (1970) which is now 17 years out of date (though this excellent account was definitive in its time).

In some cases the former name is a synonym or else the later name is a segregate species (e.g. *Pterostylis barbata*, 'now' *Pterostylis plumosa*). This is highly misleading and bound to produce confusion in the reader. Other entries are headed by the 'old' name only, thus long obsolete names are perpetuated.

A synopsis is given for each genus which includes salient features of the plants, the size of the genus and its broad distribution. Nicholls (1969) is apparently the source of much of the data some of which is dated.

Each species or entry is given a fairly lengthy description preceded by a few notes on distribution or generalities about habitat. Notes on identification or taxonomic history often follow the description. The information for each taxon is organised as continuous text unbroken by sub-headings such as 'Distribution' which would have made for greater clarity and economy of text. The description of each taxon is in botanical language with lapses into the vernacular sometimes producing an odd hybrid effect. Perhaps a concession to the lay person, this style actually serves neither the initiated or uninitiated. Some terms (e.g. *anther shell*) are inverted and highly idiosyncratic, hence obscure. Sometimes the same organ is given two different names in the one description.

Each species or taxon is illustrated with a coloured photograph (290 in total) with four or five photographs per page and about eight pages of plates grouped between pages of text and line drawings. Conceptually this is an excellent format and is very pleasing to the eye. About 24 additional photographs are of a given species habitat taken at a distance or relatively close-up.

In quality the photographs vary from very good to the reverse. Most were taken by the author but a sprinkling are the work of other photographers; these are of uniformly high quality. The faults of the poor photographs are various. In many the image is not centred (they lack balance) or the flower is viewed from an off-putting or uninformative angle such as where the labellum of a *Pterostylis* is obscured beneath or inside the galea – in the latter case the 'triggered' position. Under-exposure and/or high contrast mars other photographs. One remarkable feature is the number of photographs in which the flower is dying or dead! A large number are placed on a horizontal instead of vertical alignment. Also about eight photographs are misidentified i.e. ascribed to the wrong species.

It is, however, very pleasing to see so many photographs; they are critically important in such an identification guide. Several photographs of each taxon are even better. Photographs of some species (e.g. *Pterostylis setifera*) have never been previously published, and their appearance here is gratifying. Another feature which enhances the value of the photographs several times over is that the provenance of the plant is given.

By its title we would be led to believe that **Victorian Orchids in Habitat** gives more that cursory mention of habitat which in many species is much more specific than may be generally imagined. Any good field botanist is aware that knowledge of vegetation communities in which certain species occur carries enormously significant predictive value. Alas, the book disappoints on this score. In photographs of habitat no detail whatsoever of the floristic composition or structure of the vegetation pictured is given while there is scarcely a mention of habitat beyond words like 'forest' or 'boggy situation' in the text. No photographs are cross referenced to the text which generates frustration to the user.

The line drawings are often of very poor quality and many would not aid in identification. Some are crude in the extreme. A few are redrawn (with acknowledgement) from Nicholls (1969).

The book concludes with a glossary, a

classification of taxa *above* the level of species and indices to scientific and common names. The classification is based on Dockrill (1969) and Willis (1970), systems which now have no currency amongst orchid systematists (see Dressler 1981).

Victorian Orchids in Habitat is an attractive looking book. The cover and layout are most pleasing and it is printed on good quality paper. These features however do not redeem a book which falls short of its goal.

A final criticism is the failure of the author to examine the issue of conservation (except for *Sarcochilus falcatus*). In this age, when scores of Victorian species have been brought to the brink of extinction this is inexcusable. Surely it should underpin all our endeavours?

REFERENCES

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Galbraith, J. (1967). *Wildflowers of Victoria* Longmans, Croydon.

Nicholls, W.H. (1969). *Orchids of Australia* Thomas Nelson, Melbourne.

Willis, J.H. (1970). *A Handbook to Plants in Victoria, Vol. I.* Third edition, Melbourne University Press, Carlton.

Naturalist Review

BY IAN FAITHFUL

Beetles of Australia

BY TREVOR HAWKESWOOD

Angus and Robertson Publishers, 1987,
248pp., 192 colour plates. Soft cover. $17.95.

R.A. Crowson introduces his monumental work **The Biology of the Coleoptera** with an irresistible quotation from Charles Darwin: "Whenever I hear of the capture of rare beetles, I feel like an old warhorse at the sound of a trumpet". T.J. Hawkeswood is one who knows this feeling and **Beetles of Australia** is his fanfare. Hawkeswood should be familiar to readers because of the many contributions he has made to the **Naturalist** in recent years, notably on jewel beetles and the role of Coleoptera in pollination.

Beetles of Australia immediately captures the attention with a superb series of colour plates which illustrate 180 species and include 10 photographs of larvae and 3 of pupae. The book could not be, and "is not intended to be", a "comprehensive account" of the fauna, for there are some 20,000 named Australian beetles, another 3,000 awaiting description, plus an estimated 12,000 yet to be collected. "The main aim is to make people aware of our diverse beetle fauna and to provide them with data on the selected species . . . so that they may be able to appreciate their importance in the natural environment."

A brief introduction covers morphology, life cycles, habitat and classification. It is pitched at the beginner's level and explains simply the major biological characteristics of beetles. Where terms of entomological jargon are introduced they are usually shown in bold type and defined in a nine page glossary near the end of the book. The introduction is followed by the 120 pages which constitute the main text. Here the author gives, in systematic order, the details of each of the families illustrated, with descriptions, life histories, habitats and distributions of each of the species pictured. These family sections cover biology in greater detail and discuss the peculiarities of subfamilies and genera. The notes for each species are succinct: an average of perhaps fifty words. The glossary of terms, a useful but rather idiosyncratic eleven page bibliography grouped

by family, and a taxonomic index complete the work.

Unfortunately the text is frequently marred by minor errors, many of which could have been corrected by reference to publications cited in the bibliography. For example *Xylotrupes gideon (Fabricius)* is incorrect. Linnaeus, not Fabricius, first described this well known northern species. *Anoplognathus*, or Christmas Beetles as they are commonly called, are no more "wary" than many other beetles and do not "usually fly away upon the slightest disturbance". Not all male Dynastinae have horns on the head. *Stigmodera macularia* is known from Victoria as well as New South Wales. If there is to be a second edition of this book the author must make a determined effort to improve its accuracy.

The life histories and behaviour of over two thirds of the species dealt with are said to be "largely unknown", "not described", or similar. This adequately reflects our ignorance of Australian beetles but the reader would benefit more if the chosen species were better and not lesser known. Rather than make the statement that most Scaritinae are uncommon and poorly known, Hawkeswood should have kept to his main aim and explained that they are generally nocturnal burrowing species which are often flightless. Of course most insects are uncommon and poorly known. The message does not need overkill. The non-specialist readership to which this book attempts to appeal will be unable to appreciate the importance of these animals we know so little about.

The author admits a bias towards the beetles of New South Wales and Queensland and notes that many of the species illustrated are rare and of localised occurrence. This makes the book of rather limited use for the beginner and the residents of other states. Hawkeswood stresses the importance of documenting Australia's beetle fauna before its members become extinct. But in order for this to happen it is essential for more people to collect specimens. Now here in the book is there a clue on how to make a scientifically useful collection, nor is there a hint as to where such information could be found. There is another bias I don't like. Members of several small families are illustrated while much larger (though less conspicuous) groups (for example Melyridae, Histeridae, Pselaphidae) are ignored. Buprestidae in particular, along with Lucanidae and Ceramoycidae, the Jewel, Stag and Longicorn beetles respectively, are over represented in terms of their diversity in the Australian fauna. This is understandable because they are favourites amongst beetle collectors, being generally medium to large in size, often colourful and easier to photograph, but it is awfully misleading.

A few of the photographs are of a poor standard, at least in relation to the very high quality of the others. Living beetles are not easy to capture on film but most of the plates are unqualifiedly beautiful.

These criticisms should not deter the general reader too much. The book is a good starting point for the novice who will soon find that the major families can be readily recognised and that the biological functions of beetles are less mysterious than they seem. The layout is neat, the size convenient and the arrangement of the sections logical so that the book is pleasing to use. It deserves a place in school and public libraries throughout the country. As the only Australian book available which covers the order as a whole it is a long overdue addition to the naturalist's bookshelf.

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100 Years Ago
Lyrebird Protected

We have not forgotten our duties to the State this year. The subject of the protection of our native birds has been again brought under the notice of Government, and we have found the Commissioner of Customs very favourably disposed to our views. The Government have gone, indeed, even further in this matter than we ventured to suggest, and have proclaimed permanently closed seasons for a large number of our useful and persecuted birds. I would especially call your attention to the fact that it is now illegal at any time to take or destroy the Lyre bird; and it is to be hoped that the public will endeavour to support this attempt of the Government to save these rare and curious birds from extermination, by giving information should they become aware of any breach of the law.

From the Address by the President, A.H.S. Lucas, Victorian Nat. Vol.V, No.I, May 1888.

FIELD NATURALISTS CLUB OF VICTORIA

Report by Council

The members of the Council submit herewith balance sheet as at 31 December 1987, and statement of income and expenditure for the year ended on that date, and report as follows:-

1. The names of the members of the Executive Council in office at the date of this report are as follows:-
   Dr. J. Douglas
   Mr. G. Love
   Mr. R. Pearson
   Miss Y. Gray
   Mrs. S. Houghton
   Miss M. Allender
   Mrs. H. Stanford
   Dr. S. Henry
   Mr. R. Faragher
   Mr. M. McBain
   Mr. J. Grusovin
2. The principal activities and objects of the Club are to stimulate interest in natural history and to preserve and protect Australian Fauna and Flora. No significant change in the nature of those activities occurred during that period.
3. The net Deficit of the Club for the year ended 31 December 1987 was $1,696 (1986 Surplus $2,403) in the General Account. In addition surpluses were earned in the following Funds –
   Building Fund $1,601, Publications Fund $7,059
   Excursion Fund $3,064, Special Funds $1,513
4. The Club is prohibited from paying a dividend by its Memorandum and Articles of Association; consequently no dividend is recommended and no dividends have been paid.
5. The review of operations for the year:-
   The Club's groups met regularly throughout the year. The Botany, Day, Geology and Mammal Survey Groups arranged day trips and extended excursions. The Australian Natural History Medallion was administered and awarded to Robert G. H. Green.
6. No significant changes in the state of affairs of the Club occurred during the financial year ended 31 December 1987.
7. No matters or circumstances have arisen since the end of the financial year which significantly affected or may significantly affect the operations of the Club, the results of those operations, or the state of affairs of the Club in financial years subsequent to the financial year ended 31 December 1987.
8. The likely developments in the operations of the Club and the expected results of those operations in financial years subsequent to the financial year ended 31 December 1987 are unlikely to have any significant effect on the financial results in future years.
9. Information on Members of the Council:
   Jack Douglas - President
   Occupation - Geologist
   Council Member since – 1986
   Graeme Love - Vice President
   Occupation - Public Servant
   Council Member since – 1985
   Ron Pearson - Secretary
   Occupation – Retired
   Council Member since – 1987
   Yvonne Gray – Treasurer
   Occupation – Accountant
   Council Member since – 1986
   Sheila Houghton – Member of Council
   Occupation – Librarian
   Council Member since – 1981
   Marie Allender – Member of Council
   Occupation – Retired
   Council Member since – 1956
   Helen Stanford – Member of Council
   Occupation – Homemaker
   Council Member since – 1983
   Stephen Henry – Member of Council
   Occupation – Zoologist
   Council Member since – 1987
   Richard Faragher – Member of Council
   Occupation – Teacher
   Council Member since – 1987
   Michael McBain – Member of Council
   Occupation - Company Director
   Council Member since – 1987
   Julian Grusovin – Member of Council
   Occupation Laboratory Technician
   Council Member since – 1987
10. Since the end of the previous financial year no member of the Council has received or become entitled to receive any benefit by reason of a contract made by the Club with him or with a firm of which he is a member or with a company in which he has substantial financial interest.

SIGNED at MELBOURNE this 28th day of March 1987 in accordance with a resolution of the Council.

J. Douglas, President
Y. Gray, Treasurer

FIELD NATURALISTS CLUB OF VICTORIA STATEMENT BY MEMBERS OF COUNCIL

In the opinion of the members of the Council:-

1. (a) The accompanying Income and Expenditure Account is drawn up so as to give a true and fair view of the results of the company for the financial year ended 31 December 1987.
   (b) The accompanying Balance Sheet is drawn up so as to give a true and fair view of the state of affairs of the company as at the end of that financial year.
   (c) At the date of this statement, there are reasonable grounds to believe that the company will be able to pay its debts as and when they fall due.
2. The accompanying Accounts have been made out in accordance with Australian Accounting Standards and applicable approved accounting standards.

This statement is made in accordance with a resolution of the Members of Council.

SIGNED at MELBOURNE this 28th day of March 1987.

J. Douglas, President
Y. Gray, Treasurer

FIELD NATURALISTS CLUB OF VICTORIA
STATEMENT OF INCOME & EXPENDITURE – YEAR ENDED 31 DECEMBER 1987

INCOME

	1987 $	1986 $
Subscriptions Received		
Arrears	128	191
Current	17,038	13,931
Supporting	355	404
	17,521	14,526
Sales of "Victorian Naturalist"	140	364
Advertisements	40	35
	180	399
Interest Received		
Library Fund	15	15
Bank Account	160	227
Commonwealth Bonds	1,475	1,475
Bonds – M Wright Legacy	767	767
Bonds – C M Walker Legacy	148	148
Deposit	608	771
Life Membership Fund	78	78
Natural History Medallion Fund	296	323
	3,547	3,804
Sundry Income	60	797
Profit on Book Sales	1,125	1,655
	1,185	2,452
Deficit for year	1,696	—
	24,129	21,181

EXPENDITURE

	1987 $	1986 $
Victorian Naturalist		
Printing, Illustrating and Despatch	16,851	14,853
Less Grants		
Treasury	(1,500)	(3,013)
	15,351	11,840
Working Expenses		
Postage and Telephone	504	486
Printing and Stationery	315	547
Bookkeeping and Typing	1,500	1,000
Rent	885	825
Affiliation Fees, Subscriptions & Donations	296	292
Auditor's Remuneration (Note 4)	240	220
Insurance	325	307
General Expenses	961	737
Natural History Medallion Expenses	2,141	361
Kinglake Expenses – Rates	486	420
	7,653	5,195
Natures Show (Profit)	—	154
Author's Reprints	—	(30)
Subject Index (Profit)	—	(36)
Club Improvement Account – Transfer of Profit on Books Sales	1,125	1,655
Surplus for year	—	2,403
	1,125	4,146
	24,129	21,181

FIELD NATURALISTS CLUB OF VICTORIA
BALANCE SHEET AS AT 31 DECEMBER 1987

	Note	1987	1986
		$	$
Current Assets			
Cash at Bank		8,454	5,051
Australian Savings Bonds at cost		10,000	10,000
Accounts Receivable		168	—
Stocks on hand at cost		1,351	1,833
Total Current Assets		19,973	16,884
Non-current Assets			
Property, Plant & Equipment	5	10,042	10,042
Investments	6	140,968	133,930
Total Non-current Assets		151,010	143,972
Total Assets		170,983	160,856
Current Liabilities			
Subscriptions Received in advance		1,905	1,746
Sundry Credits		2,706	2,363
M A Ingram Trust Grant in Hand		154	154
Treasury Grants in Hand		—	1,916
Total Liabilities		4,765	6,179
Net Assets		166,218	154,677
Accumulated Funds	7	166,218	154,677

FIELD NATURALISTS CLUB OF VICTORIA
NOTES TO AND FORMING PART OF THE ACCOUNTS
YEAR ENDED 31 DECEMBER 1987

1. **Statement of Accounting Policies**

The accounts have been prepared in accordance with the accounting standards issued by the Australian accounting bodies and with the disclosure requirements of the Companies (Victoria) Code, Schedule 7, which came into operation on 1st October 1986. The accounts have also been prepared on the basis of historical costs and do not take into account changing money values or, except where stated, current valuations of non-current assets. The accounting policies have been consistently applied, unless otherwise stated.

The following is a summary of the significant accounting policies adopted by the Club in the preparation of the accounts:-

(a) **Investments**

Investments are valued either at cost less amounts written off for permanent diminution in the value of Investments or, at directors' valuation. Dividends and interest are brought to account when received.

(b) **Fixed Assets**

Fixed assets are valued at cost or valuation. No provision has been made for depreciation of the Library as in the opinion of Council its value greatly exceeds the value shown in the books of account.

(c) **Income Tax**

The Club is not liable to pay income tax.

(d) **Inventories**

Inventories are valued at the lower of cost and net realisable value.

	1987 $	1986 $
2. Operating Profit has been determined after:-		
(a) Charging as Expense -		
Depreciation of Plant and Equipment	NIL	NIL
Rental Expense on Operating Leases	885	825
(b) Crediting as Income -		
Interest Received from Other Persons	15,784	15,119
Profit on Sale of Non-Current Assets	56	750
(c) Operating Revenue -		
Membership Subscriptions	17,521	14,526
Donations	-	69
Interest	15,784	15,119
Proceeds on Disposal of Non-Current Assets	56	750
3. Remuneration of Councillors		
No remuneration was received by and of the councillors from the Club for the year ended 31 December 1987	NIL	NIL
4. Auditors' Remuneration		
Amount received or due and receivable by the auditors for:-		
Auditing the Accounts	240	220
Other Services	-	-
5. Property, Plant & Equipment		
Freehold property		
Kinglake (gift of Harold C Frahm)	-	-
Maryborough, Cosstick Reserve, at cost	213	213
	213	213
Library, Furniture & Equipment		
At cost	9,829	9,829
Less Accumulated Depreciation	-	-
	9,829	9,829
	10,042	10,042
6. Investments		
General Fund		
Australian Savings Bonds at cost	8,300	8,300
Esanda Ltd - Debentures at cost	9,000	8,800
ANZ Savings Bank - Deposit	4,672	10,268
Statewide Building Society - Deposit	1,313	603
	23,285	27,971
Building Fund		
Australian Savings Bonds at cost	3,100	3,100
Esanda Ltd - Debentures at cost	8,500	8,500
ANZ Banking Group Ltd	2,310	709
	13,910	12,309
Publications Fund		
Australian Savings Bonds at cost	45,380	45,380
Esanda Ltd - Debentures at cost	9,500	9,500
Telecom - Bonds at cost	3,500	3,500
ANZ Savings Bank - Deposit	9,900	-
ANZ Banking Group Ltd	3,632	6,217
Book Stocks at cost	6,419	6,675
	78,331	71,272

Excursion Fund		
Australian Savings Bonds at cost	1,000	1,000
ANZ Savings Bank – Deposit	9,826	9,321
Cash at Bank	14,616	18,067
Sundry Creditors	–	(6,010)
	25,442	22,378
TOTAL INVESTMENTS	140,968	133,930
7. **Accumulated Funds**		
General Fund		
Balance 1 January	14,852	12,449
Net Surplus (Deficit) for year	(1,696)	2,403
BALANCE at 31 December 1987	13,156	14,852
Specific Funds		
Building Funds		
Balance at 1 January	12,309	11,008
Net Surplus for year	1,601	1,301
BALANCE at 31 December 1987	13,910	12,309
Publications Fund		
Balance at 1 January	71,272	63,607
Net Surplus for year	7,059	7,665
BALANCE at 31 December 1987	78,331	71,272
Excursion Fund		
Balance at 1 January	22,378	18,086
Net Surplus for year	3,064	4,292
BALANCE at 31 December 1987	25,442	22,378
Club Improvement Account		
Balance at 1 January	12,763	11,108
Net Surplus for year	1,125	1,655
BALANCE at 31 December 1987	13,888	12,763
Kinglake Project Fund		
Balance at 1 January	657	484
Net Surplus for year	656	173
BALANCE at 31 December 1987	1,313	657
Sundry Bequests & Legacies		
Balance at 1 January	20,446	20,010
Net Surplus (Deficit) for year	(268)	436
BALANCE at 31 December 1987	20,178	20,446
TOTAL SPECIFIC FUNDS	153,062	139,825
TOTAL ACCUMULATED FUNDS	166,218	154,677

FIELD NATURALISTS CLUB OF VICTORIA
STATEMENT OF SOURCES AND APPLICATIONS OF FUNDS
YEAR ENDED 31 DECEMBER 1987

	1987 $	1986 $
SOURCES OF FUNDS		
Funds from Operations (Note 1)		
Inflows of funds from operations	37,951	38,127
Less Outflows of funds from operations	26,410	20,202
	11,541	17,925
Reduction in Assets		
Current Assets		
Cash at Bank – General Funds	–	1,680
Specific Funds	4,435	
Accounts Receivable	–	2,077
Stocks	738	685
	5,173	4,442
Non-Current Assets		
Proceeds on disposal of Non-Current Assets	–	5
Other Assets		
Other Investments	4,686	
Increase in Liabilities		
Creditors & Borrowings	–	1,923
	21,400	24,295
APPLICATIONS OF FUNDS		
Increase in Assets		
Currents Assets		
Bank Accounts – General Funds	3,403	-
– Specific Funds	–	11,480
Accounts Receivable	168	-
	3,571	11,480
Other Assets		
Specific Fund Investments	10,405	9,372
Other Investments	–	3,443
	10,405	12,815
Reduction in Liabilities		
Creditors & Borrowings	7,424	
	21,400	24,295
NOTE 1:		
Funds from Operations	11,541	17,925
Less – Depreciation	–	–
– Interest & Other Items Credited direct to Special Funds	13,237	15,522
	13,237	15,522
NET OPERATING SURPLUS/(DEFICIT)	(1,696)	2,403
BUILDING FUND		
Balance of Fund at 31 December 1986	12,309	11,008
Interest on Investments and Bank Account	1,601	1,301
Balance of Fund at 31 December 1987	13,910	12,309

PUBLICATIONS FUND		
Balance of Fund at 31 December 1986	71,272	63,607
Interest on Investments and Bank Account	8,337	7,549
Sundry	39	43
Surplus for the year from -		
Fossil Book	89	73
Printing Booklet Natural History Medallion	(1,406)	-
Balance of Fund at 31 December 1987	78,331	71,272
CLUB IMPROVEMENT ACCOUNT		
Balance of Account at 31 December 1986	12,763	11,108
Book Sales Account Profit	1,125	1,655
Balance of Account at 31 December 1987	13,888	12,763
EXCURSION FUND		
Balance of Fund at 31 December 1986	22,378	18,086
Interest on Investments and Bank Account	2,029	2,234
Donation	-	60
Surplus on Tours	1,035	1,998
Balance of Fund at 31 December 1987	25,442	22,378

AUDITOR'S REPORT TO THE MEMBERS OF FIELD NATURALISTS CLUB OF VICTORIA

We report that we have audited the accounts of the FIELD NATURALISTS CLUB OF VICTORIA in accordance with Australian Auditing Standards.

In our opinion the accompanying accounts, being the Balance Sheet, Statement of Income and Expenditure, Notes to Accounts, Statement of Source and Application of Funds and Statement by Members of the Council, are properly drawn up in accordance with the provisions of the Companies (Victoria) Code 1981 and so as to give a true and fair view of:-

(i) the state of affairs of the company at 31 December 1987 and of the results of the company for the year ended on that date; and

(ii) the other matters required by Section 269 of that Code to be dealt with in the accounts;

and are in accordance with Australian Accounting Standards and applicable approved accounting standards.

DANBY BLAND PROVAN & CO.
Chartered Accountants

MELBOURNE
31 March 1988

R. W. FRANKLAND
Partner

February Meeting

The talk this evening was delivered by Mr. Cam Beardsell and dealt with the topic of Fauna of the Metropolitan region. During the last 5 years moves have been afoot to produce atlases of fauna and flora for the whole of Victoria. A lot of material has been collected for birds and mammals but less work has been done for amphibians, reptiles and invertebrates. Mr. Beardsell's work hopes to collect a better picture of the wild life around Melbourne to help the management of natural areas around Melbourne.

Within the 70km study zone there are 5 main managing bodies which creates problems in planing and hence the importance of the atlases.

(Continued inside back cover)

(Continued from inside front cover)

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursions.

Botany Group – Fourth Saturday

Saturday, 28th May. Fungi. Leader: Tom May.
Saturday, 25th June. Butterfly House Melbourne Zoological Gardens.

Mammal Survey Group

Saturday, 11th June–Monday, 13th June. Tallarook Forest.

NOMINATIONS OF FNCV COUNCIL MEMBERS AND OFFICE BEARERS

FNCV Annual General Meeting will be held on Monday, 9th May, 1988 and nominations are required for Council Members and other office bearers. Council consists of the President, Vice President, Immediate Past President and ten other members. The following offices are open for nomination: President, Vice President, Secretary, Assistant Secretary, Treasurer, Assistant Treasurer, Editor, Assistant Editor, Librarian, Assistant Librarian, Excursion Secretary, Programme Secretary, Conservation Co-ordinator, Club Reporter.

With the exception of the President, Vice President and Immediate Past President, office bearers are not automatically members of Council, though the Secretary and Treasurer are required to attend Council meetings, which are held on the last Monday of the month at the Herbarium. If you nominate a person for a particular office, and that person is willing to be a member of Council, an additional nomination to this effect is required. Council is the governing body of your Club. Think now of the people you would like to form this body, and ask them if they will accept nomination.

The Club is entitled to two representatives on the Conservation Council of Victoria. We also require an Information Officer (at General Meetings) and a Display Co-ordinator. If you would like to undertake these jobs, or know of members who would, please let the Secretary know.

Ron Pearson
Hon. Secretary

(Continued from page 30)

To date most of the work has occured to the west of Melbourne which is surprisingly diverse and complex.

The importance of this work was highlighted by the plight of the Eltham Copper Butterfly which is under threat from housing development. There are many unknown factors involved

- there is an undescribed genus of ant tied into the butterfly life cycle
- the butterfly is depended on a dwarf form of *Bursaria spinosa* (0.4m tall).

Just how all these are inter-related are yet to be found and researches are battling against time to save them.

Other examples of the survey was presented including material on Green's Bush, Altona Skipper Butterfly, The Pines (Frankston), Mt. Disappointment, Leadbeaters Possum, Yellow Bellied Glider and the Long Forest Flora Reserve.

All these areas and animals are still poorly understood and are vulnerable to development and man's influence and hence need to be protected before they are lost.

Exhibit's

- 3 Microscopes showing pond life from local areas around Dan McInnes' place.

  Skull of a Western Grey Kangaroo: Julian Grusovin.
- Invertebrate growth from a boat slipped after being in the water for only 2 years: Russell Ward.

Nature Notes

A young possum rescued from a road kill has been reared to a stage where it can be released into the wild.

- At Emerald, King Parrots are only seen during winter but after the recent heavy rains they have been seen.

  Mid January in a letter box a Marbled Gecko was found.

  Green's Bush: Echidna, Japanese Snipe, Wedge Tail Eagle, Western Grey Kangaroo.

  Gecko: found in cast iron cover of water meter kept cool in hot weather. Seen over several months.

Meeting Closed 10.05pm.

Field Naturalists Club of Victoria

In which is incorporated the Microscopical Society of Victoria
Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron
His Excellency, The Rev Dr John Davis McCaughey, The Governor of Victoria.

Key Office-Bearers 1987-1988

President: Dr JACK DOUGLAS, 42 Sunhill Rd., Mt. Waverley, 3149 (277 4804 A.H.)

Vice President: Mr G. LOVE, P.O. Box 2018, St. Kilda West, 3182.

Secretary: Mr. RON PEARSON, 23 Avenza St., Mentone, 3194 (584 7443)

Hon. Treasurer: Ms YVONNE GRAY, 46 Albany Cres., Surrey Hills, 3127 (890 1488 A.H.)

Subscription-Secretary: Mr N. STANFORD, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

Editor: Mr. R. THOMSON, FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141 (344 7743 B.H.)

Librarian: Mrs SHEILA HOUGHTON, FNCV, National Herbarium, Birdwood Avenue, South Yarra, 3141 (551 2708 A.H.)

Excursion Secretary: Miss MARIE ALLENDER, 19 Hawthorn Avenue, Caulfield, 3161 (527 2749)

Club Reporter: Mr. RICHARD LARAGHER, Lot 7, Cathay Street, Ferntree Gully, 3156 (758 6302)

Conservation Co-ordinator: Mr. STEPHEN HENRY, 4 Darryl Street, Bulleen, 3105.

Sales Officer (Books): Mrs H. STANFORD, 100 Middlesex Road, Surrey Hills, 3127 (830 1505)

Sales Officer (Victorian Naturalist only): Mr D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Group Secretaries

Botany: Miss MARGARET POTTER, 1 249 Highfield Road, Burwood, 3125 (29 2779).

Day Group: Mr D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Geology: Miss HELEN BARTOSZEWICZ, 16 Euroa Avenue, Nth. Sunshine, 3020 (311 5106 A.H.)

Mammal Survey: Mr JULIAN GRUSOVIN, 17 Sutherland Street, Chadstone, 3148. (211 4997)

Microscopical: Mrs ELSIE GRAHAM, 147 Broadway, Reservoir, 3073 (469 2509)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1988

Metropolitan Members (03 area code)	$25.00
Joint Metropolitan Members	$27.00
Country/Interstate/Retired Members	$23.00
Joint Country/Interstate/Retired Members	$25.00
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The Victorian Naturalist

Vol. 105, No. 3

May/June 1988

Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

$3·50

The Field Naturalists Club of Victoria

F.N.C.V.

NATIONAL HERBARIUM Birdwood Avenue, South Yarra, 3141

CALENDAR OF EVENTS, JULY-DECEMBER 1988

JULY

Sun 3 **General Excursion.** "First Impressions" exhibition, Museum of Victoria.

Tue 5 **Fauna Survey Group.** Workshop on Skeletal Identification. Lawrie Conole.

Wed 6 **Geology Group.** "Solar Energy Before the Year 2000." Elizabeth Hauer.

Sat 9 **Fauna Survey Excursion.** Stag Watching for Leadbeater's Possum. Upper Yarra catchment.

Mon 11 **General Meeting.** "Life & Substance in High Latitudes." Dr John Béchervaise.

Thu 14 **Botany Group.** Members' Night.

Wed 20 **Microscopical Group.** Plant Histology & the Microscope.

Thu 21 **Day Group.** Urban Forest, East Malvern. Leader: Dan McInnes 211 2427.

Sat 23 **Botany Excursion.** Australian plantings & heathland at the Cranbourne Annexe of the Royal Botanic Gardens.

Sat 23 - Sun 24 **Fauna Survey Excursion.** Water Rats at Werribee.

Mon 25 **Council Meeting.**

Fri 29 **Hawthorn Juniors.** "Sea Mammals."

AUGUST

Tue 2 **Fauna Survey Group.** "Hump Back Whales." Janet Lanyon.

Wed 3 **Geology Group.** "Plate Tectonics & Australia." Gabi Love.

Sun 7 **Hawthorn Juniors Excursion.** Alpine trip to Lake Mountain (including some skiing).

Mon 8 **General Meeting.** "Orchids of Victoria." Mr I. Morrison.

Sun 7 **General Excursion.** Burnley Gardens.

Thu 11 **Botany Group.** "Some Problems for the Conservation of the Flora & Fauna of the Courtney's Road Reserve, South Belgrave." Garrique Pergel.

Sat 13 **Fauna Survey Excursion.** Stag Watching for Leadbeater's Possum. Upper Yarra catchment.

Wed 17 **Microscopical Group.** Marine Biology & the Microscope.

Thu 18 **Day Group.** Yarra Bank Walk - Northern side. Leader: Joan Miller 836 2681.

Fri 26 **Hawthorn Juniors,** Birthday meeting.

Sat 27 **Botany Excursion.** Courtney's Road Reserve, South Belgrave. Leader: Ilma Dunn.

Sat 27 - Sun 28 **Fauna Survey Excursion.** Water Rats at Werribee.

Mon 29 **Council Meeting.**

SEPTEMBER

Sun 4 **General Excursion.** Gellibrand Hill Park & Greenvale Reservoir.

Tue 6 **Fauna Survey Group.** "The Ecology & Conservation of the Long-Footed Potoroo." David Scotts.

Wed 7 **Geology Group.** "Chris Poole's Meteor Impact Theory Revisited."

Thu 8 **Botany Group.** "Problems in Pea Flowers." Margaret Corrick.

Mon 12 **General Meeting.** Members' Night.

Thu 15 **Day Group.** Woodland Park, Essendon. Leader: Andy Blackburn 379 8960.

Wed 21 **Microscopical Group.** How to Make a Rock Section to Examine Under the Microscope. The Use of Polarised Light.

Sat 24 **Botany Excursion.** Orchids The Common, Warrandyte State Park. Leader: Cecily Falkingham.

Mon 26 **Council Meeting.**

Date to be finalised **Hawthorn Juniors Excursion.** Weekend camp to Warrnambool. Possible viewing of whales.

OCTOBER

Sun 2 **General Excursion.** Brisbane Ranges.

Tue 4 **Fauna Survey Group.**

Wed 5 **Geology Group.** "Seismology in Australia." Gary Gibson.

Fri 7 **Hawthorn Juniors.** "Pond Life."

Mon 10 **General Meeting.** "Dinasaurs in Victoria." Dr Tom Rich.

Thu 13 **Botany Group.** "Orchids." George & Thelma Spice.

Sun 16 **Hawthorn Juniors Excursion.** Pond life – Willesmere Pond.

Wed 19 **Microscopical Group.** Photography Through the Microscope. Microscope Life on Video.

Thu 20 **Day Group.** 100 Acres, Park Orchards. Leader: Betty Gillespie 578 1879.

Sat 22 **Botany Excursion** Flora Reserves & Railway Reserves. Remnant vegetation, Seymour area. Leader: Peter Carwardine.

Mon 24 **Council Meeting.**

Fri 28 **Hawthorn Juniors.** "Reptiles."

Sat 29 - Tue 1 Nov **Fauna Survey Excursion.** Inverleigh Common.

NOVEMBER

Wed 2 **Geology Group.** "Catastrophes, Extinctions & Evolution." Max Campbell.

Sun 6 **General Excursion.** President's Picnic.

Tue 8 **Fauna Survey Group.**

Thu 10 **Botany Group.** "Grasses." Suzanne L. Duigan.

Mon 14 **General Meeting.** Australian Natural History Medallion Presentation.

Wed 16 **Microscopical Group.** The Microscope: General Discussion, Questions & Answers. Display of Members' Exhibits Under the Microscope.

Thu 17 **Day Group.** Lilydale & Lilydale Museum. Leader: Andy Blackburn: 379 8960.

Fri 25 **Hawthorn Juniors.** "Desert Life" (including wildflowers & animals).

Sat 26 **Botany Excursion.** Grasses.

Mon 28 **Council Meeting**

DECEMBER

Sat 3 or Sun 4 **General Excursion.**
Sat 3 - Sun 4 **Hawthorn Juniors Excursion.** Little Desert.
Tue 6 **Fauna Survey Group.** Members' Night.
Wed 7 **Geology Group.** Members' Night.
Thu 8 **Botany Group.** Annual Meeting & Members' Night.
Mon 12 **General Meeting.** "A Field Naturalist in Iceland." Mary Doery.
Christmas - New Year holidays **Fauna Survey Excursion.** Ned's Corner, Mallee.

JANUARY

mid January **General Excursion.** Kosciusko & Canberra.

For more details of events, see current *Victorian Naturalist.*

CONTACTS

PRESIDENT – Graeme Love 697 5109 (BH).
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MEETING TIMES & VENUES

* General meetings start at 8 pm and are at the Royal Society Hall, 9 Victoria St., Melbourne.
* All other meetings, except Day Group and Hawthorn Junior F.N.C., start at 8 pm and are at the Astronomer's Residence, Birdwood Ave., South Yarra.
* Hawthorn Junior F.N.C. meets at 7.30 pm at the Balwyn Primary School Hall, cnr. Balwyn & Whitehorse Rds., Balwyn. Other details of their meetings and excursions are subject to confirmation.

GENERAL MEETINGS (Second Monday)

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria Street, Melbourne.

Monday, 6 June, 8 p.m.
Dr. Jim Willis "A Naturalist Around the British Isles". (Meeting is a week earlier due to Queens birthday holiday.)

Monday, 11 July, 8 p.m.
Dr. John Bechervaise "Life and Substance in High Latitudes".

Monday, 8 August, 8 p.m.
Mr. I. Morrison "Orchids of Victoria".

New Members

Metropolitan:
Mr. Alex Kutt – East Kew.
Mr. Gilles Lecordier – Keysborough.
Mr. Walter S. Mould - East Malvern.
Ms Carmel M. McPhee - Northcote.

Joint Metropolitan:
Mr. Robert D. Croll and Mrs. Grietje Croll – Olinda.
Mr. Clinton Hale and Mrs. Rosemary Hale – Brunswick West.
Mrs. Margaret Travers and Mr. Geoffrey Travers – Nunawading.

Country/Interstate:
Mr. A. J. Hicks – Kaniva.
Mr. Lee E. Seary – Junee.

FNCV EXCURSIONS (First Sunday)

Sunday, 3 July. Museum of Victoria. This is the final day of the "First Impressions" exhibition on the British coming to Australia, organised by the British Museum of Natural History and the Museum of Victoria. There is a $5 charge to see the exhibition, but there are other displays to interest people who may have seen it. Meet at 10 a.m. at the Russel St. entrance. Bring a picnic lunch in case we wish to do something in the afternoon.

Sunday, 7 August. Burnley Gardens. Meet at first carpark inside the entrance at 11 a.m. Bring lunch.

Sunday, 4 September. Gellibrand Hill Park and Greenvale Reservoir. Coach will leave Batman Avenue 9.30 a.m. Bring a picnic lunch. Bus fare $12.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Avenue, South Yarra (150 metres nearer the Shrine than the Herbarium) at 8 p.m.

Botany Group – Second Thursday

Thursday, 9 June. "Kashmir – In Search of Wildflowers." Hilary Weatherhead.

Thursday, 14 July. Members' Night.

Thursday, 11 August. "Some Problems for the Conservation of the Flora and Fauna of the Courtney's Road Reserve, South Belgrave." Garrique Pergel.

Continued on inside back cover.

The Victorian Naturalist

Volume 105, Number 3

May / June, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Photo: Drymopila moorei. Photo by M. Olsen (see page 43)

Bush-peas of Victoria – Genus *Pultenaea* Sm. (Fabaceae) – 23

By M. G. Corrick*

***Pultenaea mollis* Lindl. in Mitchell, Three Exped. Interior East. Austral. 2:258(1838).**
***P. hibbertioides* J. D. Hook., Fl. Tasman. 1:89(1856).**

Pultenaea mollis is a shrub 1-3 m high, erect or spreading or occasionally semi-prostrate.

The stems are terete with irregularly spreading, curled or twisted pale hairs.

The leaves are alternate, narrow-elliptic or linear with inrolled margins, or more commony, terete, (7-)10-20(-26) mm long, including petiole 1-2 mm long, and 0.3-1 mm wide; the leaf-tip is acute but not pungent.

The upper surface, when visible, is glabrous, the lower surface has loosely appressed or spreading hairs. In some forms the hairs are tubercle based.

The stipules are (1.5-) 2-3 (-5) mm long and are usually very dark brown and strongly recurved or almost coiled, except in Dandenong Range and some East Gippsland populations where the stipules are appressed to the stem.

The inflorescence is a very condensed raceme of about 4-10 flowers clustered at the tip of a lateral shoot. Most plants are very floriferous and flowering shoots are often clustered towards the ends of branches, causing the shrub to become spreading, with branches more or less arched or pendulous. In some forms the flowering shoots are spread out along the branches with these remaining erect.

The flowers have pedicels from 1-5 mm long, but the pedicel is often obscured by the tightly packed bracts or enlarged stipules.

The bracts of *P. mollis* are highly variable, being derived from the stipules of the leaf subtending each flower. They show a graduation from an almost normal leaf with slightly enlarged and united stipules, to very enlarged stipules with greatly reduced leaf. Often this vestigial leaf is broken off, or occasionally absent, giving rise to the apparently "bifid bract" mentioned is some descriptions.

The bracteoles are highly variable; they are usually ovate, 2-8 mm long and 1-2 mm wide and attached at the base of the calyx tube. They are often viscid, variously hairy or with ciliate margins. Some populations have lobed bracteoles similar to the bracts.

The calyx, excluding the pedicel, is (4-) 5-6 (-8) mm long and covered to varying degrees with pale hairs; the calyx lobes are acute to acuminate and slightly shorter than the calyx tube. In many forms the calyx is viscid.

The flowers are 8-12 mm long. The standard is orange with dark red lines surrounding a pale yellow blotch at the base; the wing petals are orange, occasionally with red tips and the keel petals are red.

The ovary is covered with pale hairs which extend about half-way along the style.

The pod is plump and usually almost enclosed by the calyx.

Flowering time is from mid September to early December. It is widespread across southern Victoria, mainly south of the Dividing Range. There is one isolated population in northern Tasmania.

P. mollis is a highly variable species. I have seen most of the presently known populations in Victoria in the field, as well as a wide range of herbarium specimens, and have been unable to find a set of well correlated and consistent features on which to separate the many forms.

Hooker (1856), Bentham (1864), Will-

* 7 Glenluss Street, Balwyn, Victoria, 3103.

Fig. 41. Pultenaea mollis. Southern Grampians form: A, habit x 1; B, inflorescence x 2; C, t.s.leaf x 5; D, leaf underside x 5; E, bract x 10; F, calyx x 3; G, fruiting calyx x 8; H, seed x 8; J, standard x 4; K, ovary and style x 6.(A-J and K from Corrick 5736, G and H from Corrick 5753B).

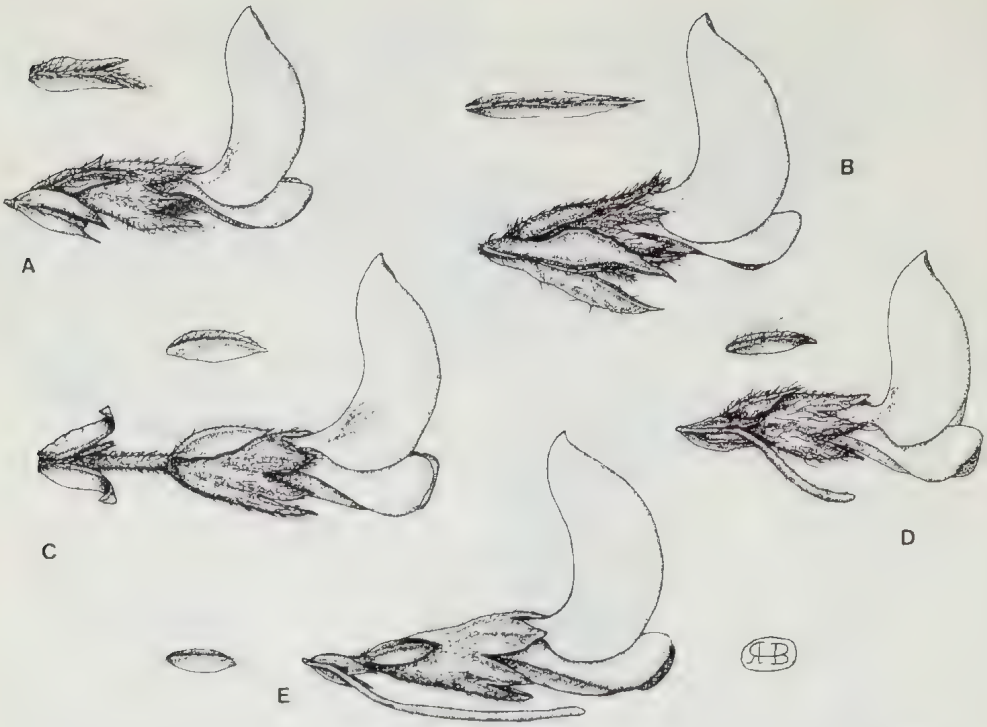

Fig. 42. Pultenaea mollis, calyx, bract and bracteole forms. A, Grampians, (from Corrick 6207); B, Wilson's Promontory (from Filson 5364); C, Grampians, (from Muir 2695); D, Portland, (from Corrick 8627); E, Gembrook, (from Muir 5151).

iamson (1922 and 1928) and Willis (1967) all referred to problems of variation in *P. mollis* and the related species *P. hibbertioides* and *P. viscosa*.

I have not seen the type of *P. hibbertioides*, but I have seen plants growing in the type locality near Georgetown, Tasmania, and believe it should be included in this concept of *P. mollis*.

Fig. 42 illustrates five forms of *P. mollis* showing a range of variation in calyx, bracteoles, bracts and floral leaf.

I am uncertain of the status of *P. viscosa* but prefer to retain it as a separate species for the present. (See following note.)

SPECIMENS EXAMINED included: Grampians: Yarram Gap Rd., 21.xi.1976, *M. G. Corrick 5753B*(MEL); Serra Range, 20.xi.1976, *M. G. Corrick 5736*(MEL); Turret Falls, 3.xi.1962, *T. B. Muir 2695* (MEL); Wannon River at Mt. Sturgeon, 14.ix.1836, *T. L. Mitchell 299*(MEL) Syntype. Nelson-Portland road, 18.ix.1983, *M. G. Corrick 8627*(MEL); Wilsons Promontory, 26.ix.1963, *R. Filson 5364*(MEL); Gembrook, 27.ix,1973, *T. B. Muir 5151* (MEL).

***Pultenaea viscosa* R.Br. ex Benth., Fl. Austral. 2:127(1864)**

Pultenaea viscosa is so similar to *P. mollis* that a separate detailed description seems unwarranted.

It differs from most forms of *P. mollis* in having larger, longer bracteoles, larger bracts and stipules and broader leaves. However these characters are present singly in some of the forms of *P. mollis*. Broad leaves can be found in Portland populations and at the type locality near Mt. Sturgeon. Broad bracteoles occur in collections

Fig. 43. Pultenaea viscosa. A, habit x 1; B, stem x 3; C, t.s.leaf x 3; D, calyx, bract and bracteole x 4; E, calyx and bracteoles x 4; F, inflorescence x 2; G, fruits x 2; H, bract x 5; I, standard x 5; J, ovary and style x 4. (all from Corrick 6147.)

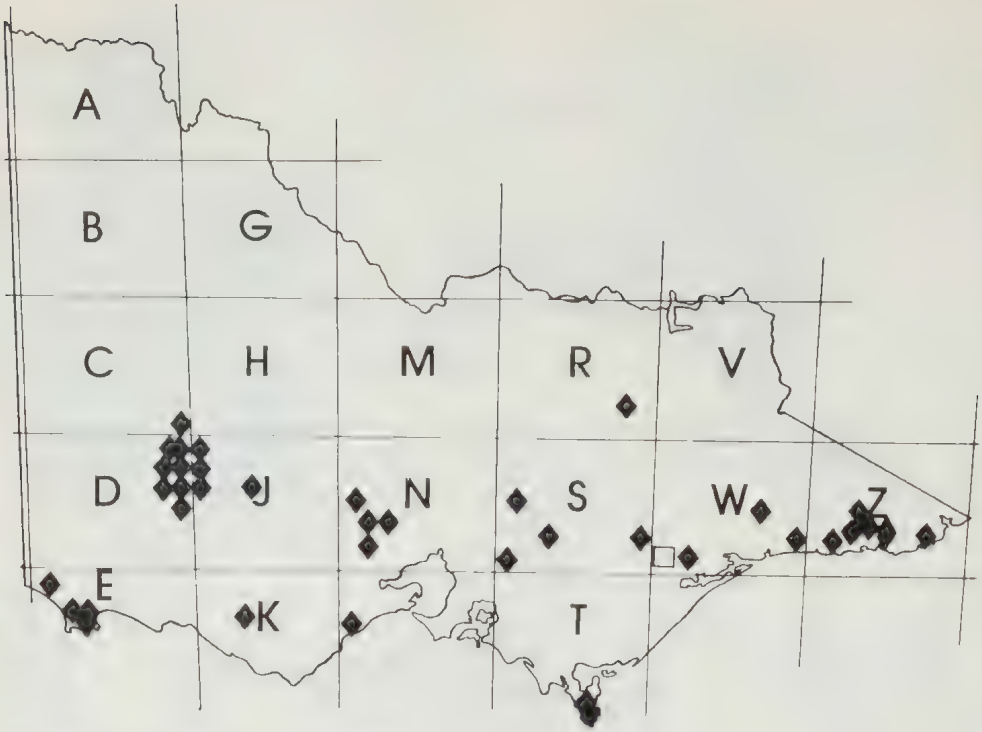

Fig. 44. Known distribution of *P. mollis* and *P. viscosa* in Victoria.

◆ *P. mollis*

P. viscosa

from the Grampians, whilst large bracts and bracteoles appear in specimens collected from Wilson's Promontory.

P. viscosa is rare in Victoria, and appears now to be confined to a rocky hillside off the Dargo road, north of Bairnsdale. The National Herbarium of Victoria has an old fragmentary collection from near Bulumwaal, but searches in the locality in recent years have failed to locate it again.

SPECIMENS EXAMINED included: Northern boundary of Paramatta, ix.1803, *R. Brown* (MEL 35413, Syntype); Wombargo Range, ix.1860, *F. Mueller* (MEL 515018); near Dargo road, i.ii.1978, *M. G. Corrick 6147*(MEL).

Acknowledgements

I am most grateful to Richard Barley for the accompanying illustrations and to Dr. J. H. Ross for continued access to the collections and facilities of the National Herbarium of Victoria.

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Observations on the Behaviour of the Brush-tailed Phascogale *(Phascogale tapoatafa)* at Black Hill, Victoria

By Ian D. Lunt*

Introduction

The brush-tailed phascogale or tuan *(Phascogale tapoatafa)* occurs in all mainland states of Australia (Cuttle, 1983). Its life history and behaviour under laboratory conditions were studied recently by Cuttle (1982a,b) but relatively little is known of its behaviour in the wild. It is regarded as being 'possibly threatened' in Victoria (Ahern, 1982) and is uncommon to rare in North Central Victoria (Menkhorst and Gilmore, 1979).

Black Hill Bushland Reserve occupies 48 ha at Edgecombe, 9 km north of Kyneton, Victoria (144°29′20″E, 37°11′15″S). The geology is of Devonian granite (Land Conservation Council Victoria, 1973), and the vegetation is an open-forest of *Eucalyptus obliqua* (messmate stringybark), with *E. viminalis* (manna gum) and *E. melliodora* (yellow box) being common on the lower slopes. There are scattered *Acacia dealbata* (silver wattle) above *Senecio quadridentatus* (cotton fireweed), *Hydrocotyle laxiflora* (stinking pennywort) and the exotic annuals, *Briza* spp. (quaking-grasses) and *Aira* spp. (silvery hair-grasses).

Observations and discussion

Two brush-tailed phascogales were observed during a spotlighting survey at Black Hill on 13 February 1986. The first phascogale was seen at 11.15 pm (E.S.T.) in an old messmate. The animal was actively foraging for food on the tree-trunk. It was extremely active, and rapidly bounded up and down the trunk and along the larger limbs. It did not appear to avoid the white spotlight. After six minutes of arboreal foraging the phascogale descended to the ground and began foraging in the ground litter. Ground foraging was active noisy, and with little apparent caution. The phascogale then scurried up and over an old tree-stump, and across the ground to a sapling messmate, where it resumed hunting on the bark. It was lost to view at 11.26 pm after it descended to the ground once again.

A second phascogale was sighted at 12.02 am. It behaved in a similar fashion: actively foraging on tree-trunks and larger branches and frequently moving across the ground. While it was foraging in a messmate, a sugar glider *(Petaurus breviceps)* landed on a branch of similar height in an adjacent tree 10 m distant. The phascogale completely ignored the sugar glider and continued searching the bark for food. Similarly, the sugar glider appeared to take no notice of the phascogale.

Neither phascogale ventured onto the small, upper branches of trees; all arboreal movements were restricted to trunks and to large boughs. This behaviour was also noted by Fleay (1934). Fleay (1934, 1947) and Harrison (1961) also commented on the timidity of brush-tailed phascogales when confronted by sugar gliders.

Earlier observers do not appear to have recorded foraging on the ground by brush-tailed phascogales. Ride (1980) believed the species to be 'almost exclusively arboreal'. The brief observations from Black Hill suggest that ground foraging may contribute in a minor way to food gathering, perhaps by increasing the diversity or availability of prey species. Kitchener (1983) stated that the closely related, red-tailed phascogale *(Phascogale calura)* was "largely arboreal... [but] appears to feed extensively on the ground". Future studies may show that the brush-tailed phascogale forages on the ground more than is presently realized.

* 15 Brookes Crescent, Macedon, 3440.

Acknowledgements

I wish to thank the Macedon Range Conservation Society for providing the spotlights. Grants from the M.A. Ingram Trust enabled the Society to buy this equipment.

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Erratum: *Westringia lucida* Boivin (Lamiaceae): A New Species for Victoria

By Adrian Pyke and John Westaway

These illustrations of *Westringia lucida* were inadvertently omitted from the paper published in the Victorian Nat. 105 (2) p.9. they are presented here with apologies to the authors.

Ed.

Westringia lucida x 1

Westringia lucida x 4

Illustrations by Miss V. Tellini.

Note: this species was recorded during a botanical survey for the Flora and Fauna Survey Group (Dept. Conservation, Forests and Lands). Results are reported in Pyrke *et al.* (1988) *Flora and Fauna of the Clover and Pretty Valley Forests Blocks, N.E. region, Vict.* Vict. Ecol. Survey Rept. 25 D.C.F.L.

Observations on the Floral Phenology and Visitors of *Drymophila moorei* (Luzuriagaceae) in South-east Queensland.

BY J. G. CONRAN *

Introduction

Pollination in the 'lilies' (Liliiflorae) generally involves insect-, bird- or self-pollination (Knuth, 1909; Kieghery, 1982). In Australia, little appears to be known about the pollination of the native Liliiflorae. The Haemodoraceae, Xanthorrhoeaceae and Blandfordiaceae are bird-pollinated (Ford *et al.*, 1979), although *Xanthorrhoea* is also insect-pollinated (Armstrong, 1979). *Calectasia* (Dasypogonaceae) however, is self-pollinating (Paterson & James, 1973). The introduced *Kniphofia uvaria* Moench is both bird and insect visited, but probably mostly bird- or self-pollinated Conran (1987a).

Drymophila moorei Baker (Fig. 1) is a small (c.30 cm tall) shrub of mixed eucalypt/rainforest at altitudes above c.500m from the Queensland/ N.S.W. border to coastal central N.S.W. The flowers are relatively small (10-15mm diam.) and borne in axillary cymes of 1-3 buds. Only shoots produced in the spring produce flowers, with shoots produced at other times remaining permanently sterile. The white to pale-pink flowers are pendant, dish-bowl shaped and lack obvious colour patterns, odours or specialised pollination modifications.

Flowers are generally inconspicuous and the anthers dehisce about 2 days after opening of the perianth, possibly indicating protogyny. The styles are 2-3 mm long and do not change in size or shape during the time the flowers remain open. The stigmatic surface is Wet *sensu* Heslop-Harrison & Shivanna (1977). The tepals have basal nectaries, but no conspicuous nectar is produced. The perianth and stamens are deciduous after 2-3 weeks, with unfertilised ovaries remaining attached for up to a further 2 weeks.

* Botany Department, Monash University, Clayton, Victoria, 3168.

Fruits develop slowly. The 1-3 seeded berries are hard and green for 5-6 months becoming succulent and bright orange upon maturity in autumn-winter. Ripe fruits usually persist on the plant for 4-6 weeks, although some may remain until just before the following flowering season in November (Conran, 1988). As part of a study of the taxonomic relationships of *Drymophila* (Conran, 1985, 1987), the pollination biology and subsequent fruit production of *D. moorei* was investigated at Springbrook SEQld over a two year period. The results of this work are presented here.

Methods

Observations were made between 20 November 1982 and 19 April 1984 on a 20 m^2 colony of *D. moorei* in a mixed *Eucalyptus acmenioides* Schau./ Notophyll Vine Forest at Warrie National Park, Springbrook Plateau on the Qld/ N.S.W. border (26°14'S, 153°17'E, alt. c.900m). The colony consisted of 10 individual clumps and grew intermingled with *Viola hederacea* Labill., which flowers at the same time as *D. moorei*. 'Single' plants were defined as those with discrete spaces between the rhizomatous clumps. Determination of the extent of individual multi-stemmed plants by excavation would have involved the destruction of the colony.

Observations were made over the full flowering period of both years, but with intensive observations from sunrise to sunset on 24 November 1982, and from early morning to mid-afternoon from 8-10 November 1983 at the period of peak anthesis for the colony (flowering was observed to be relatively synchronised, and restricted to a period of a few weeks in late spring.

The presence and behaviour of visitors

Figure 1. Drymophila moorei Baker flowering shoot. Photo by M.Olsen.

to the flowers was noted at 10 minute intervals on half of the colony. The apparent importance of the visiting insects was determined by the feeding behaviour of the insect and whether there was both pollen and stigma contact during the visit. To determine if insects other than those observed might be associated with *D. moorei*, the other half of the colony was net swept at half-hourly intervals.

Results and Discussion

Floral Development

Average floral densities, both as flowers/shoot and flowers/m^2 were measured. The average fruit-set by the same plants, both per plant and per metre squared was determined, and the percentages of fruit-set per flower were calculated for the two years (Table 1) and the results for the two years compared using Students t-test. No significant differences were found between the two years and the results were pooled to give population averages.

The colony produced an average of 3.7 flowers per (flowering) shoot (24.8 flowers/m^2). These plants, however, produced only 1.4 fruits per plant (1.5/m^2) giving an average fruit set of 5.4%. This fruit-set is low in comparison with 45% for *Wurmbea dioica* (R.Br.) F.Muell. ssp. *alba* Macfarlane (Colchicaceae) Ornduff (1985) and 90% for *Kniphofia uvaria* (L.) Hook.f. (Conran, 1987a), especially as *D. moorei* colony produces only 1-3 seeds per fruit, whereas the other two species produce numerous seeds per fruit. Because the *D. moorei* consists of 10 multistemmed individuals, it is possible that the low fruit sets could be due to self-incompatibility as is the case in *Laxmannia* (Paterson & James, 1973) or to a variety of other reasons.

Insect Visitors

Insects visiting the flowers were captured and, with insects caught by net sweeping, identified (Table 2) and deposited at Queensland Museum (QM).

The times of day and frequency of insect visits to the flowers, as well as the total time spent observing the colonies are shown in Figure 2. Insects tended to visit flowers which were in full sunlight, and this occurred at the site between 8.30 am and 1.00 pm during the study period because of the nature of the vegetation above the

Table 1. Flower (Fl) and fruit (Fr) production and density in *Drymophila moorei* for 1982-3. n = numbers of flowering or fruiting shoots, m^2 or flowers sampled. t = Student t- test score. p = probability. n.s. = not significant.

Year	Fl/Shoot	Fl/m^2	Fr/Shoot	Fr/m^2	Fr Set/ Flower
	x±SD	x±SD	x±SD	x±SD	%
1982	3.5±1.6	24.0±4.9	1.5±0.7	1.7±0.7	5.9
n	(137)	(20)	(18)	(20)	(480)
1983	3.8±1.9	25.6±6.0	1.3±0.6	1.2±0.7	4.5
n	(135)	(20)	(13)	(20)	(512)
t	0.1208	0.2065	0.2626	0.5051	
p	n.s.	n.s.	n.s.	n.s.	

study plants. Observations at the site were accordingly concentrated during sunny periods.

Insects captured represented 4 orders, with 20 species from 10 families (Table 1). However, only a few were seen to actively visit the flowers, and only two species were common (Figure 2).

Possible Pollen Vectors

The significant visitors to *D. moorei* flowers varied throughout the observation period (Figure 2). Syrphid flies (*Baccha* sp., *'Syrphus' serrerius* Weidmann and Syrphidae spp. 1 & 2) were common visitors, in particular Syrphidae spp. 1 & 2, although they all showed low fidelity, indiscriminantly feeding on both *D. moorei* and *Viola hederacea* Labill. within each feeding bout. Syrphidae spp. 1 & 2 were not discernable from each other in the field and are thus treated together in fig. 2. Feeding occurred in bouts of about 30 seconds per flower, during which time the insects examined the anthers, tepal bases and styles with their probosci, collecting pollen and stigmatic exudates. Examination of captured specimens revealed very little pollen on the bodies of the flies, as was the case with Syrphids visiting *Eucalyptus muelleriana* Howitt (Ireland & Griffin, 1984), although Faegri & van der Pijl (1979), Armstrong (1979) and Kay (1982) consider them to be efficient pollinators, albeit pollen feeders.

Although Orthoptera are not normally considered to be pollinators, a cricket

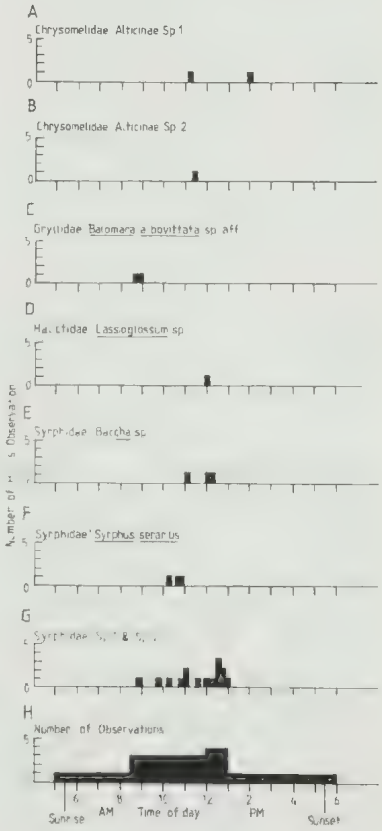

Figure 2: Frequency histograms of the numbers of feeding bouts by floral visitors of *Drymophila moorei* (A-F) and the number of hours and times of observations (G) at the Springbrook site. A: Sp. 1 = *Arispoda*? sp.; B: Sp. 2 = *Arispoda chrysis sp. aff.*

Table 2 Insect visitors captured on flowering plants of *D. moorei* throughout the flowering season. * indicates specimens observed actively feeding on flowers.

Orthoptera: Grylloidea	
Gryllidae:	*Balamara albovittata* Chopard *sp. aff.* *
Hemiptera: Homoptera	
Aphrophoridae:	*Anyllus leiala* Kirkaldy
Thysanoptera: Tubilifera	
Phlaeothripidae:	1 sp. indet.
Coleoptera	
Elateridae:	*Dicteniophorus* sp. indet.
	: *Parasaphes elegans* Candeze
Chrysomelidae: Alticinae:	*Arispoda*? sp. indet. *
	Arispoda chrysis Oliver *sp. aff.* *
	Psyllioides brettinghami Baly
	Sutrea sp. indet.
Chrysomelidae: Chrysomelinae:	*Oomela trifasciata* Lea
	: sp. 1 indet.
Chrysomelidae: Eumolpinae:	*Edusa glabra* Blackburn
Diptera	
Syrphidae:	*Baccha* sp. indet. *
	: *'Syrphas' serarius* Weidmann *
	: spp. 1 & 2 indet. *
Dolichopodidae:	*Heteropsilopus tweedensis* Bickel
Muscidae:	*Dichaetomyia terraereginae* Malloch
Hymenoptera	
Tiphiidae:	*Pentazeloboria janeta* Brown
Halictidae:	*Lasioglossum* subgen. *Chilalictus* sp. indet *

(*Balamara albovittata* Chopard *sp. aff.*: Gryllidae) was seen to visit the flowers and actively feed on pollen. During this time, the insect came in contact with the stigmas as well as the anthers, and it is possible that pollen grains attached to its mouthparts could be transferred. The species was locally abundant and active during the day, although as only one specimen visited the flowers and because it eats pollen, and lacks suitable places where pollen could attach for transfer, its contribution to pollination is probably minimal. Clyne (in Key, 1974) reported a species of *Zaprochilus* (Tettigoniidae) feeding on pollen and nectar, but there appear to be no other reports for Australian Orthoptera.

Two species of Chrysomelidae: Alticinae (*Arispoda chrysis* Oliver. aff. and *Arispoda*? sp.) fed on the pollen and stigmas on *D. moorei* with *Arispoda*? sp. relatively abundant . These species also fed on the tepals, gynoecia and young leaves so it is questionable whether any benefit from inadvertent pollen transfer was offset by damage to the gynoecia.

One of the more likely pollen vectors of *D. moorei* was a small bee (*Lassioglossum* sp.:Halictidae), which, while only observed on one occasion, was very efficient at pollen collection during its feeding bout. Although most of the pollen was stored in a scopa on its hind femora and coxae, the insect was liberally covered with pollen so that transfer could be easily effected. It visited only flowers of *D. moorei* during a 10 minute feeding bout, spending about 30 seconds at each flower. The bee climbed all over the flowers providing ample opportunity for pollen transfer. In addition, many flowers from several different plants were visited in quick succession. This behaviour would effect pollen transfer between compatible individuals much more efficiently than the syrphids where there was observed to be about a 50% chance that the next flower visited after *D. moorei* was the equally abundant *V. hederacea*. The white/pink flowers of *D. moorei* are of the dish-bowl-shaped type described by Faegri & van der Pijl (1979) and based on floral morphology, the predicted pollinators would be wasps, beetles and flies, and on blossom colour; beetles, flies, bees and moths. The insects observed visiting the flowers fall largely into these groups, although the cricket was not expected.

Conclusions

Drymophila moorei at Springbrook, has a short flowering season of a few weeks

in the late spring, during which the flowers are visited by a suite of insects including hoverflies, a native bee, flea-beetles and a cricket. The cricket and flea-beetles, both of which are pollen feeders may inadvertently transfer pollen and could act as minor pollinators, although both damage the plants. The flowers are also visited by three species of hoverfly and an Halictid bee. These latter insects appear to be pollen vectors for *D. moorei*, with the Halictid in particular showing high host fidelity, and good potential for pollen transfer.

The relatively low seed set suggests that the pollen vectors are inefficient, individual genets may have low self-compatability or may have other unexamined possibilities contributing to low seed-set. This requires further study to determine the causes of low seed-set in the colony.

Acknowledgements

Dr Geoff Monteith (QM, Brisbane), Dr Ken Walker (MOV, Melbourne) and Dr Tom Wier (ANIC, Canberra) are thanked for assistance with insect identifications; the Queensland National Parks and Wildlife Service for permission to carry out the research (permits nos. 484, 560 and 618); and Dr Dennis O'Dowd (Zoology Dept., Monash University) for comments on the manuscript.

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Naturalist Notes

Dolphins and the Giant Cuttlefish *Sepia apama*

By Martin Schulz*

The calacareous "cuttlebone" is a well-known object washed up amongst the flotsam and jetsam of ocean beach tidelines in southern Australia. Cuttlefish belong to the Class Cephalopoda (which includes squids and octopus) and are active carnivores preying on other molluscs, fish and crustaceans (Boletzky 1983). The largest (cuttlebone measuring up to 30 cm long) and most common cuttlefish washed up on southern Australian beaches is the Giant Cuttlefish *Sepia apama* Gray (Macpherson & Gabriel 1962).

While undertaking regular beach walks along Discovery Bay in western Victoria between 1983 and 1988 I found a number of beachwashed cuttlebones with distinct teeth marks in the "bone".

These teeth marks appeared to originate from dolphins. To confirm this an assortment of cuttlebones displaying these marks were taken to the Museum of Victoria and the teeth imprints were compared to the dentition of small cetaceans likely to occur in the waters off western Victoria.

The teeth imprints matched those of two species: the Bottle-nosed Dolphin *(Tursiops truncatus)* and the Common Dolphin *(Delphinus delphis)* (Figures 1 and 2). Out of sixty-nine cuttlebones with teeth imprints forty-eight (69.6%) matched the Bottle-nosed Dolphin and 21 (30.4%) the Common Dolphin.

These two species of dolphin are common in the waters off western Victoria and south-eastern South Australia (pers obs).

Fig. 1. Teeth impressions on cuttlebone of *Sepia apama* matching those of the Bottle-nosed Dolphin *(Tursiops truncatus).*

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The teeth marks in the cuttlebone may originate from dolphins preying on cuttlefish and/or playing with cuttlebone floating on the sea surface. Both species of dolphin take a wide variety of prey, including cephalopods (eg. Norman & Fraser 1937, Sergeant 1958, Slijper 1962, Gaskin 1972 and Watson 1981). Therefore it is not surprising that evidence of dolphin predation on cuttlefish should be found washed up on ocean beaches. However, dolphins also play with cuttlebones floating on the surface of the sea. For example, in February 1987 I saw a group of Spinner Dolphins *(Stenella longirostris)* playing with a cuttlebone floating on seas off Kiama, central New South Wales. A dolphin would race up to the cuttlebone from underneath flick it into the air, rush through the water to where the decending cuttlebone would hit or leap out of the water to intercept it and again flick the "bone" into the air and continue playing in this manner for several minutes. Other dolphins would join in and try to get to the descending cuttlebone before the original dolphin reached it. At no stage were the dolphins seen to bite the cuttlebone, however, it is likely that floating cuttlebones are occasionally bitten by investigating and/or playful dolphins.

Acknowledgements

Thanks to J. Dixon and L. Huxley from the Museum of Victoria for allowing me access to and photographing small cetacean skulls and dentition.

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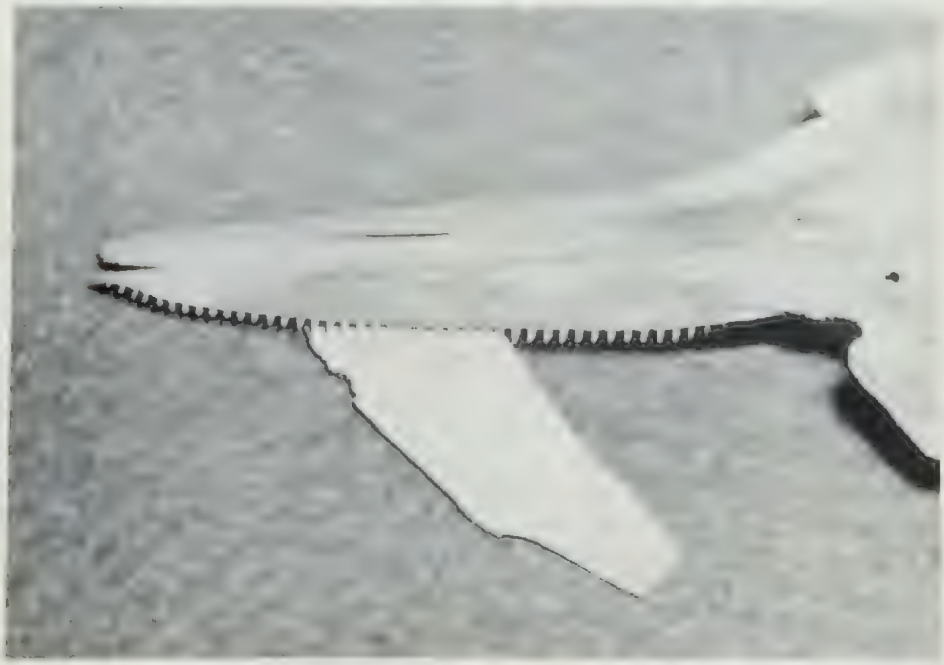

Fig. 2. Teeth impressions on cuttlebone of *Sepia apama* matching those of the Common Dolphin *(Delphinus delphis).*

Host Plants of the Introduced Parasite, *Cuscuta epithymum* (Common Dodder) in Natural Herblands on the Keilor Basalt Plains, Victoria

By Ian D. Lunt*

Cuscuta L. is a genus of herbaceous, parasitic, leafless twiners, most of which are annuals. They are commonly called "dodders". There are five native and seven naturalized species in Australia (Jessop and Toelken 1986). *Cuscuta epithymum* (L.) Murr., the Common Dodder, is a proclaimed noxious weed in Victoria as it parasitizes agricultural legumes, particularly lucerne *(Medicago sativa)*. *Cuscuta* species do not feed on grasses (Parsons 1973). This article gives a brief account of *C. epithymum* in natural herblands and lists a number of host species. Botanical names follow Forbes and Ross (1988). Specimens of *C. epithymum* will be lodged with the National Herbarium of Victoria (MEL).

Natural herblands on the Keilor basalt plains commonly occur in shallow depressions that are seasonally inundated with freshwater. They support a variety of forbs and grasses, including *Danthonia duttoniana* (Brown-back Wallaby-grass), *Lobelia pratioides* (Poison Lobelia), *Agrostis avenacea* (Brown-grass), *Lythrum hyssopifolia* (Small Loosestrife), *Eryngium* species, and introduced species such as *Leontodon taraxacoides* (Hairy Hawkbit) and *Plantago coronopus* (Buck's-horn Plantain) (Platt 1983; Lunt 1988). The herblands are often small, and in relatively undisturbed sites are usually surrounded on higher ground by grasslands of *Themeda triandra* (Kangaroo Grass). Small herblands and *C. epithymum* occur in three reserves in the western Melbourne area: Laverton North Grassland Reserve, Point Cook Metropolitan Park and the (still to be proclaimed) Derrimut grassland (Platt 1983; Cantrill and Lunt 1984; Lunt 1988).

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Cuscuta epithymum grows in *Themeda* grasslands on forbs including *Convolvulus erubescens* (Pink Bindweed), *Eryngium ovinum* (Blue Devil) and *Helichrysum apiculatum* (Common Everlasting). However, it is far more common in herblands, probably because suitable hosts are more abundant; *Cuscuta* seedlings die if they do not contact a suitable host within a few days of germinating (Parsons 1973). Twenty species of host plants were recorded from Derrimut and Point Cook, and all but one were native (Table 1). At Derrimut, it was most prolific on *Haloragis heterophylla* (Raspwort), *Lobelia pratioides* (Poison Lobelia) and, to a lesser extent, *Dichondra repens* (Kidney-weed). It was not observed on *Eleocharis acuta* (Common Spike-rush), *Juncus subsecundus* (Finger Rush), grasses or legumes. Although introduced legumes occurred in all three reserves, they were not common in herblands.

Cuscuta epithymum will be difficult to eradicate from conservation reserves as agricultural methods of control, such as cultivation and poisoning, are of greater detriment to native vegetation than is the parasite itself. However, it probably does not threaten natural herblands as seriously as do many other introduced species, including *Leontodon taraxacoides* and *Plantago coronopus*. It was not observed to kill host plants and, as most host plants occurred at low densities, it never dominated the ground cover. As *Cuscuta* species are spread by grazing stock (Parsons 1973), the exclusion of stock from reserves containing natural herblands could greatly retard its establishment and dispersal.

Acknowledgements
Dale Tonkinson and Dr. R. F. Parsons kindly commented on the manuscript.

Table I. Host plants of *Cuscuta epithymum.* All species were recorded from the Derrimut grassland except *Ranunculus rivularis* from Point Cook Metropolitan Park. Asterisks denote introduced species.

Scientific Name	Common Name
Acaena echinata	Sheep's Burr
Asperula conferta	Common Woodruff
Calocephalus citreus	Lemon Beauty-heads
Calotis scapigera	Tufted Burr-daisy
Convolvulus erubescens	Pink Bindweed
Craspedia glauca	Common Billy-buttons
Dichondra repens	Kidney-weed
Eryngium ovinum	Blue Devil
Eryngium vesiculosum	Prickfoot
Haloragis heterophylla	Raspwort
Helichrysum apiculatum	Common Everlasting
* *Hypochoeris radicata*	Cat's-ear
Leptorhynchos squamatus	Scaly Buttons
Lobelia pratioides	Poison Lobelia
Marsilea hirsuta	Short-fruit Nardoo
Minuria leptophylla	Minnie Daisy
Plantago gaudichaudii	Narrow-leaved Plantain
Ranunculus rivularis	Small River Buttercup
Schoenus apogon	Common Bog-rush
Stellaria palustris	Swamp Starwort

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The Excursion to Tasmania, 8 to 16 January, 1988

The Field Naturalists' trip to Tasmania in January 1988 followed closely on that of 1986, and was prompted by the desire to take advantage of the presence of the "Tall Ships" in Hobart during the period of our visit. At the same time we were able to consolidate and extend our knowledge, and to visit areas not included in the previous journey. Tribute should be paid to the organizing ability of Marie Allender, who, once again, brought together a diverse group of nature enthusiasts and presented them with a program of outstanding interest.

Reports by Dr. Jim Willis on the botany, and by Lil Kirk on the ornithological aspects were so word perfect that they are presented verbatim, and make up the bulk of this account. During the excursion the other party members made full use of their expertise, while, at the same time, contributing their quota in the areas of their own specialties. Cameras were much in evidence. I was able to add 27 species to bring to more than 100 my collection of slides illustrating Tasmanian flora. Advantage was taken of the presence of Dr. Willis in the party to verify the identification of the specimens concerned. The co-operation of all of the members in locating objects of interest and sharing their knowledge contributed to the undoubted success of the excursion.

Our party of twenty-six was met at Devonport air terminal by chartered coach, and driven straight along the northern coast – Bass Highway – to Stanley for lunch. Our tour ticket included an ascent, by chair-lift, of the township's chief attraction, the towering 'Nut' (about 150 m).

The Nut was originally well forested with *Eucalyptus obliqua* and *E. Viminalis* (as old photos show), but from settlement in 1826 it has been gradually denuded for farming activities - crops of potatoes were once raised there and sledged down its steep declivities. Nowadays only a few stunted Manna Gums and wind-flattened Bursarias cling tenaciously to the more sheltered crevices of the basalt slopes; but some 100 species of native plants (chiefly herbs) still survive there, including the now rare Shore Spleenwort *(Asplenium obtusatum),* Crimson Berry *(Cyathodes juniperina)* and the white form of Hoary Sunray *(Helipterum albicans).* Butterfly Flag *(Diplarrena moraea)* remains a conspicuous tussock around the summit area.

At Smithton, where we stayed for two nights, there was little of scenic interest. Garden specimens of New Zealand Christmas-tree *(Metrosideros excelsa)* were in heavy crimson bloom. The mouth of muddy Duck River has a small area of salt-marsh flora among prevailing clumps of *Melaleuca ericafolia* (Swamp Paperbark) - *Samolus repens, Mimulus repens, Lobelia alata, Selliera radicans* and *Cotula reptans* in flowering mats on the damp saline peat.

Still following the Bass Highway south-westerly from Smithton one passes through much rich pastoral country to Togari, then Marrawah whence an unsealed road leads south through thickets of stunted *Eucalyptus nitida* (Shining or Smithton Peppermint) to the west coast, at the Arthur River mouth. The Arthur is the longest and largest river on the northern part of Tasmania's rugged west coast. Much *Senecio adoratus* (Scented Groundsel) was in bloom at the jetty. Our cruise upstream passed through dense forests of *Eucalyptus obliqua, E. Viminalis* and *E. Ovata.* Around the junction with Frankland River ("Turk's Landing") a rainforest is dominated by *Nothofagus cunninghamii* (Myrtle Beech) and *Acacia melanoxylon* (Blackwood), with such smaller shade-loving trees as *Pittosporum bicolor* ("Cheesewood"), *Anopteris glandulosus* (Tasmanian Laurel), *Eucryphia lucida* (Leatherwood – two forms), *Acradenia frankliniae* (Whitey-wood) and *Prostanthera lasianthos* (Christmas Bush). Tree-ferns, smaller ferns and mosses are abundant. The whole forest hereabouts was unusually dry, and under stress of drought; nevertheless two shade-enduring orchids were seen in flower, *Chiloglottis gunnii* and *Gastrodia sesamoides.* Huon Pine *(Dacrydium franklinii),* although occurring on and south from the Pieman River, does not grow as far north as the Arthur. So, back to Smithton.

A detour to the lookout point on Table Cape, next day, afforded good views of Wynyard, framed by foreground bushes of *Bursaria spinosa* in thick, creamy, scented blossom – alive with insect patrons. Between Wynyard and Yolla fields of flowering and fruiting opium poppies *(Papaver somniferum)* invited a stop for photography. Lunch at Hellyer Gorge on the Murchison Highway allowed time to walk through a rain-forest of tall Myrtle Beech – the edges unfortunately under vigorous invasion by

introduced Blackberry *(Rubus sp.)* which is blocking pathways and open spots. Berries of *Notelaea ligustrina* (Privet Mock-olive) and endemic *Aristotelia peduncularis* (Heart Berry) were admired and photographed here.

Deviation to Warratah enabled inspection of the derelict mining area against Mt. Bischoff (a rich tin field from 1870). Here, among old extraction scars and dumps, were numerous plants of interest, viz, *Lycopodium fastigiatum* (Mountain Clubmoss), *Microtis unifolia* (Common Onion Orchid), *Gaultheria hispida* (Waxberry), *Cyathodes parvifolia* (Pink Mountain Berry), *Olearia phlogopappa* (Dusty Daisy-bush) and *Cassinia aculeata* (Common Cassinia or Dogwood) which is known to Tasmanians as "Dolly-bush". Also conspicuous was a dainty, wiry, white-flowered annual that would seem to be some introduced species of *Arenaria* (Sandwort).

For the 54 km to Roseberry, Murchison Highway passes over much open plateau-like country of pleasant appearance – well spaced trees of *Eucalyptus dalrympleana* (Mountain Gum) and *E. delegatensis* (Alpine Ash or "Woolly-butt") with light understory and an abundance of Butterfly Flag; wetter terrain produces treeless button-grass plains. Towards Queenstown, and with increasing rainfall, Myrtle Beech, Leatherwood and Sassafras *(Atherosperma moschatum)* became conspicuous, undershrubberies of *Gaultheria hispida,* taller *Cyathodes* spp. and Wiry Bauera *(B. rubiodes)* occurring frequently. A stop at the briefly worked Serpentine mine near Dundas (now abandoned) yielded good samples of this "greasy" colourful rock and some associated Stichtite (a rare purplish mineral). The vast area around Queenstown, spectacularly denuded through sulphurous fumes from copper smelting, is becoming slowly but naturally revegetated, chiefly by Wattle species, Christmas-bush and the Tassel Cord-rush *(Restio tetraphyllus).*

Beyond the derelict mining townships of Gormanston and Linda the Lyell Highway affords fine views of forested peaks (including Mt. Jukes and Frenchman's Cap). Many gullies are full of Celery-top Pine *(Phyllocladus asplenifolius),* Leatherwood, Tasmanian Laurel and Horizontal *(Anodopetalum biglandulosum)* – a formidable barrier to walkers through South West Tasmania. Some attractive flowers around Cynthia Bay, at the southern end of beautiful Lake St. Clair, were *Banksia marginata, Lomatia tinctoria, Hibbertia procumbens,* the endemic *Callistemon viridiflorus, Leptospermum lanigerum, Stylidium graminifolium, Gratiola nana* and *Utricularia monanthos* (the last two forming mats in seepage areas). In the vicinity of Derwent Bridge *Eucalyptus pauciflora* (White Sallee) was covered with heavy summer blossom, and there were many fine trees of the endemic, rough-barked peppermint *E. amygdalina.*

At Bronte, 26 km east from Derwent Bridge, a cairn was unveiled in 1984 to mark the geographical centre of Tasmania. Bushland near Bronte Lagoon provided a colourful display of purple Grass Trigger-plants, white Mountain Gentians *(Gentianella diemensis)* and Guitar Plants *(Lomatia tinctoria)* and various yellow pea-flowered bushes; an unusual native grass was *Agropyron pectinatum* (Comb Wheatgrass. Between Ouse and New Norfolk lay a stretch of parched-out and rather unattractive pastoral country, except for green and orderly hop plantations along the Derwent flats. The trout and salmon pondages at Plenty, in their setting of big coniferous trees, furnished a welcome item of much interest. There we saw albino trout, and what was probably the tallest (40 m) example in Australia of Maritime Pine *(Pinus pinaster),* replete with its striking tessellated bark pattern in warm coppery hues.

A day's excursion from New Norfolk gave ample opportunity to see cool rain-forests, mountain heathland, the dramatic outlines of Mt. Field Plateau, Lakes Gordon and Pedder, with the distant prospect of the jagged Arthur Range. The high, curved retaining wall of the Lake Gordon impoundment was an engineering object for wonder and admiration, as it spans a narrow ravine of awesome depth. On the return, halts were made to botanize on wet heaths against the Sentinel Range:– yellow *Xyris gracilis* white massed blooms of *Leptospermum scoparium* (broad-leafed montane variant), endemic *Baeckea leptocaulis* and *Agastastachys odorata* (inappropriately dubbed "White Waratah" – also at a comfort stop near Maydena where delicious Lemon-scented Boronia *(B. citriodora)* rubbed shoulders with Shaggy-pea (*Oxylobium ellipticum* – flower finished) and healthy seedlings of Celery-topped Pine.

After the excitement of "Tall Ships" moored at crowded wharves at Hobart, one was grateful to arrive in the tranquil setting of Port Arthur, with its tall venerable Blue Gums lining the shore. Large numbers of Masked Lapwing were foraging on the damp grassy flats. An unexpected bonus in the evening was a screening of Marcus Clarke's "For the Term of His Natural Life" (1929 vintage) at the local cafe – supper

included with the ticket. Next morning was devoted to inspections of the various convict ruins and impressive Island of the Dead whereon almost 2000 bodies, of both convicts and free persons, are believed to have been buried. The islet was completely cleared of all vegetation in a disastrous "improvement" programme during 1937; but under sensitive management by the National Parks and Wild Life Service, groups of She-oaks and other protective native vegetation are now being maintained.

On through Sorell, Buckland (a brief stop to admire St. John-the-Baptist Church, its old graveyard and famous 14th century stained-glass window), Orford and Swansea to Bicheno for two nights. Our second-last day was spent visiting Coles Bay, at the entrance to Freycinet National Park. This mountainous tract of granite has much to offer the naturalist: dramatic tors and boulders (with dykes and zenoliths), spectacular views (unfortunately obscured by mist at the time we climbed the central ridge above charming Wineglass Bay), a rich flora and abundant wildlife, especially trustful wallabies. Among noteworthy plants were *Acacia terminalis, Conospermum taxifolium* (localized in Tasmania to parts of the east coast, and quite rare in far eastern Victoria), *Eriostemon virgatus, Pomaderris elliptica, Eucalyptus tenuiramis* (endemic peppermint with attractive streaked bark and silvery young growth), *Calytrix tetragona, Leucopogon collinus* and *Ixodia angusta* (an endemic everlasting). Along the beach tall Coast Beardheath *(Leucopogon parviflorus)* bore clusters of white edible berries.

Limited time was available for "shelling" on the few beaches we visited, but 37 mollusc species were listed for Coles Bay and 52 at Bicheno, the tally for the whole trip being 72 species of marine shells. A large species of turretted screw shell (to 8 cm long) was frequent around Spiky Bridge, Swansea and Bicheno. This was identified as the New Zealand *Maoricolpus roseus,* now thoroughly naturalized at several places along Tasmania's east Southern coast:– when and how was it introduced?

The Tasman Highway between Bicheno and Scottsdale passes through an intriguing range of scenery – coastal scapes, mountain rain-forest and colourful pastoral country. Among the eucalypts, Manna Gum and Messmate are almost ubiquitous; fine stands of Silvertop *(Eucalyptus sieberi)* are to be seen along steep St. Mary's Pass (between St. Mary's and Scamander), while Mountain Ash *(E. regnans)* appears with Myrtle Beech around Weldborough. We alighted at the latter place to wander through a wonderful reserve of roadside rain-forest featuring tall Beeches, many Tree Ferns and a variety of small epiphytic ferns; delicate *Hymenophyllum flabellatum* (Shiny Filmy Fern) grew in abundance on the shady sides of *Dicksonia* trunks. The journey from Scottsdale to Devonport, via the Lower Tamar suspension bridge at Sidmouth, proved rather uneventful, except for a detour to visit the renowned Lavender Farm about 16 km WNW from Scottsdale. In eight days we had seen a wonderful cross-section of the Tasmanian flora (excluding the alpine genera) but including more than 50 species in flower.

This excursion was not particularly fruitful for bird-watchers, as so many hours were spent in the bus, reducing smaller and more active species to the ornithologist's nightmare, L.B.J.s: (little brown jobs). It did give an opportunity to review the status of Tasmania's common birds, usually passed over in the quest for the rarer indigenes. Apart from the constant clouds of European Starlings, the bird that says "Tasmania" is, of course, the Masked Lapwing, replacing Victoria's Australian Magpie by the roadside. It was, however, interesting to note an increase in the number of White-backed Magpies, particularly in the east of the state, and they appear to have consolidated their position.

Tasmanian Native Hens were observed in many areas, and the four species of well-fed Cormorants indicated that there was no shortage of fish in Tasmanian waters. We were often delighted by the graceful shapes of the hunting raptors: Swamp Harrier, Brown Falcon and Kestrel.

The bird highlights of the first week were the sighting of two magnificent White-breasted Sea Eagles over the Arthur River, where the Porteus family feed them occasionally; a large flock of Ibis, including the not-so-common Straw-necked Ibis' and a juvenile Fantailed Cuckoo in his clown suit.

The four lucky people who continued with Tastrek added eighteen more species to their original 54. Their first stop was at Sharman's Tea Gardens, where all Tasmania's indigenous honey-eaters, and others, with swift parrots and many other birds, delight in the mixture of untouched forest land and the bird-feeders, in a large area of native and exotic trees and shrubs of many kinds.

Nearly all of this journey was on private forest tracks. Heading across the Central Plateau, a

stop was made at Pencil Pine Lake for a splendid array of alpine flora, including two types of Cushion Bush: *Pterygopappus* and *Abrotanella; Euphrasia, Boronia, Richea* and *Baeckia.*

On the second day, while travelling through A.P.M. forest in the shadow of Vyld's Crag, a party of three Lyre-birds brought the vehicle to a halt by walking several times across the road. Another botanical display at Mt. Tim Shea included many lichens, *Blandfordia, Pentachrondria, Kunzea, Boronia, Bauera, Stylidium* and *Pimelea* species.

The third day, calm, bright and sunny, gave the party a tremendous thrill of a flight from Hobart across the mountains (where the pilot waggled his wings at a group of climbers on top of Mr. Frederick) to Cox Bight where lunch was eaten on the white sand, while the party gazed across the gently rolling waves and beautiful cirrus clouds to Matsuyker Island, imagining the change winter storms would bring to the scene. Fringing the beach was a belt of vegetation, including species of *Melaleuca, Leptospermum, Pomaderris, Acacia* and several berry bushes. Beyond this was a plain that would be a swamp in wetter conditions, and on this was a mat of low-growing flowers of many species, even *Banksia* bushes were no more than 60 cms high, and among the rushes were Forked Sundew *(Drosera binata),* Fairies Aprons *(Utricularia dichotoma),* Swamp-heath *(Sprengelia incarnata), Kunzea ambigua* and many others. The only "serpents" in this Eden were clouds of very large and very hungry March Flies. Back in the 4WD, the party followed the south-eastern coast as far as the road would go, to Cockle Creek, staying at Dover en route, at the "southernmost hotel in Australia". At the Hastings State Reserve, a 30 minute walk among the forest and Man-ferns of the thermal springs area was accompanied by Black-headed Honeyeaters. A young eel was enjoying the warm water in a pool, but no Platypus were seen.

Returning to Hobart, the group took the historic road through Oatlands and Ross to Launceston, and on the last day, visited the top of Mr. Barrow by way of a zigzag road. There, Mountain Gentians covered the ground in superb display.

A private road through rainforest, splendid with Beech, Sassafras, ferns and a carpet of Liverwort, led to stony, hilly cattle-and-tree-farming country. Finally, a visit was made to the Asbestos Range National Park and Baker's Beach, to compare the northern coastline with the southern. The trip was over, but, as the party returned to Devonport, a group of Flame Robins and Grey Fantails induced it to linger and watch them for a while. It was an excellent farewell.

Dr. J. H. Willis, L. Kirk, J. A. Blackburn

Lerderderg Gorge State Park

For many years the Committee of Management of the Lerderderg Gorge State Park has been pressing for upgrading of the Eastern end of the park – "Darley Ford".

Over the last two years, our pressures have started to bear fruit.

1. A piece of land has been purchased on the North side of the river and this has joined the park with the road at "Darley Ford". There was previously a distance of approximately half a kilometre between the two.
2. A small piece of the orchard adjoining the parking area has been purchased to make extension and improvement of the parking area possible as well as the provision of conveniences.

O'Briens Crossing

The O'Briens Crossing picnic and camping area has become so popular that it is at present severely overloaded.

It is quite apparent that camping and day visiting (picnicing) do not mix. Because of this it is hoped that additional camping areas can be set up and so release of O'Briens Crossing for day visitors.

Areas have been looked at:

(a) Adjacent to O'Briens Crossing but up stream on the north side for a few sites.
(b) At the north end of the 'Upper Chadwick track'. Where an attractive area could be used for limited sites.
(c) Margarets Corner for limited number of sites.
(d) When the 'Black Snake mine' hopefully terminates, its operational area could release an ideal site for many campers.
(e) Junction of XL track and Sardine creek limited sites.

The conflict of interests between trail-bike riders, 4 wheel drivers and management has been a continuing problem for many years.

Over the last year or more the problem has been significantly reduced by the effort of David Munday, the ranger from the Werribee Gorge who has been patrolling the Lerderderg as well as the Werribee Gorge and the Long Forest Flora Reserve of a weekend.

Unfortunately David's staff has dropped from 'two plus one part-time' to just himself and one part-time contractor, whereas his patrol areas have trebled.

Efforts to have additional staff appointed for him have not born fruit as yet.

Bush Fires

The forest has shown great regeneration from the devastation caused by the Greendale and Trentham fires.

The understory in some areas is so dense that some walking tracks will need some clearing to keep the tracks passable.

Forest Drive

The concept of a 'Lerderberg Forest Drive' is a possibility for a future development. Upgrading roads and a descriptive brochure would be necessary.

Maps

An upgraded and greatly improved map of the park will be shortly published. It was to be released before Easter but delays have occured.

It will include descriptive features as well as the map.

The gazetting of the area as a State Park is imminent.

Jack Myers
FNCV Representative,
Committee of Management,
Lerderderg Gorge State Park

Botany Group Excursion to Mullum Mullum Creek led by John Reid 27 February 1988

We had a very interesting walk along the Mullum Mullum Creek. There was some water still in the creek, but the area round was exceedingly dry, and some plants e.g. *Spyridium parvifolium* (Dusty Miller) were hard to recognize because they were so dehydrated. This was primarily an excursion to look at the food plants used by butterflies and moths.

We were fortunate in seeing quite a number of butterflies - the Ringed Zenica with its bullseye marking, the common grass blue low down on the paddocks. Its food is legumes - originally it would have been local species, but now it feeds extensively on clovers - the Meadow Argus with its strange flight, the Shouldered Brown with a dark brown blotch and the Symmomes skipper butterfly whose caterpillar feeds on *Lomandra longifolia*, the Spiny-headed Matrush. The latter was an especially interesting sighting as we had already examined the chewed leaves of this Lomandra. The caterpillars shelter in the day-time either near the roots of the plants, or make a shelter by securing two over-lapping leaves with a silk-like thread. We found an example of these over-lapping leaves where the caterpillar had pupated.

We saw the caterpillar of the Painted acacia moth, also called the Painted apple moth, on a wattle among the blackberries, and a looper caterpillar which would have been of another species of moth, as only moth caterpillars move in this way.

John pointed out the importance of leaving dead trees in the bush – many living things live and breed in the holes in dead trees. They may look untidy, but they remain valuable in the environment.

We looked at the vegetation along the creek. Examples were: *Alisma plantago aquatica* (Water Plantain) actually in the Creek, *Lobelia alata* (Angled Lobelia) in the wet soil just beside the creek. *Eucalyptus viminalis* (Manna Gum) and *E. ovata* (Swamp Gum), were the trees by the creek. Higher up were *E. melliodora* (Yellow Box) and *Acacia dealbata* (Silver Wattle). There were also specimens of *E. polyanthemos* (Red Box) but they had probably been planted there.

There are still some native grasses e.g. *Poa ensiformus* a purple-sheathed Tussock-grass, and *Themida australis* (Kangaroo Grass). Unfortunately many weeds are flourishing - many of the daisy family.

After lunch we moved up to Antonia Park. In spite of the very dry conditions there were some flowers to be seen. *Cassinia arculeata* (Common Cassinia), *C. arcuata* (Drooping Cassinia), *Helichrysum dendroideum* (Tree Everlasting), and especially *Leptorhyncus squamatus* (Scaly Buttons).

Part of the area has been burnt and it will be interesting to see what appears in the spring-time.

Win Bennett

FNCV Day Group Annual Report 1987

Chairman: Mr. Ian Gillespie
Vice Chairman: Joan Miller
Secretary: Dan McInnes

Again members arranged a program of excursions that could be taken on public transport. Visits were made to the interesting places listed below, each time a member of the group acted as Leader who had the job of finding any historical or other information available and to arrange the transport details.

Month	Excursion	Leader
February	Flagstaff Gardens, St. James Cathedral and Meat Market Craft Centre.	Dan McInnes
March	Cancelled (Train strike).	
April	The Planetarium, National Museum.	Andy Blackburn
May	Caulfield Park and Caulfield Racecourse Museum.	Dan McInnes
June	Burnley Gardens	Joan Miller
July	The Museum of Chinese – Australian History.	Andy Blackburn
August	The Australian Gallery of Sports.	Betty Gillespie
September	The Blackburn Lake.	Marge Wilson
October	Banyule Flats Reserve, Rosanna.	Dan McInnes
November	Patterson River, Carrum.	Dan McInnes

The average attendance was 12 with the visit to the Planetarium attracting 16 members.

Dan McInnes
Secretary

FNCV Botany Group Annual Report 1987

Members of this group continue to enjoy the meetings on the second Tuesdays and excursions on the fourth Saturdays. Numbers keep quite constant on the whole. While the alterations are being made to the Herbarium we have been meeting in the Astonomer's Residence.

On the printout of FNCV members many have indicated their interest in Botany who do not take part in our activities, which is rather surprising. We are always ready to welcome new faces and new ideas for talks and excursions.

This has been our programme for the year:

Meetings

February	Bram Dawson — 'Port Phillip Bay – Yesterday, To-day and Tomorrow'
March	Betty Terryll — 'Some Wildflowers of Kakadu National Park'
April	Hilary Weatherhead — 'Western Australia - Darling Ranges and Western Sand Plains'
May	Geoff Carr — 'The Impact of Introduced Weeds on the Native Flora'
June	Members' Night
July	Dr. Elizabeth Turner — 'Botany in the Service of Medicine'
August	Mary Doery — 'Natural History Courses Attended in NE and SW England'
September	Ilma Dunn — 'Plants of the Anglesea Area'
October	Tim New – 'The Biological Control of Australian Acacias in South Africa'
November	Andrew Paget - 'Operation Revegetation - the Community Nursery, Knox'
December	AGM and Members' Night

Excursions

February	Warburton, (Ferns and Mosses) Hilary Weatherhead
March	Grantville, Stefanie Rennick
April	Doongalla Forest Reserve, Cecily Falkingham
May	Kinglake Area, (Fungi) Tom May
June	Royal Botanic Gardens, (Plants Used by the Aborigines) Lorna Crowther
July	Mornington Peninsula and Eaton's Cutting, (Boneseeding) Stefanie Rennick and Tom Sault
August	Warneet East, Margaret Potter
September	Anglesea (Angair Show)
October	St. Andrews and Panton Hill, Dorothy Mahler
November	Sorrento Back Beach.

Thanks to all those who have contributed by their knowledge and enthusiasm to the year's programme of the Botany Group.

Win. Bennet.
Hon. Sec.

FNCV Geology Group Annual Report 1987

Well, our group certainly began 1987 with a bang (so-to-speak). Attendance for February was approximately 60 members and visitors. This was due to the return of Dr. Andrew Prentice and part three of his report on the latest discoveries in our Solar System (Voyager series).

The year produced/presented a wide variety of subjects, such as; Neil Archibald - The Geological Timescale; Mr. Marc Marsden (Melb. Uni.) - The Bottom of the Continental Shelf; Kemal Inan - Borate Minerals, Anatolia, Turkey; Gabi Love - A Geology of Australia; Dr. Ramsay - Some aspects of mineralization in Victoria. This year even saw talks delivered by the Club's President (Dr. Jack Douglas: The Ancient Floral History of S.E. Australia) and Vice President (Chernobyl).

Other aspects included; Dinosaur Cove (Ms S. Bartoszewicz); African Trip - Slides (Mike

Burstan); Saltation around Shepparton/Kerang/Lake Boga (Roy Dodds); an excursion the Yarra Glen Antimony Mine; a B.B.Q. at Keith and Joan Rissenson's home.

As usual, but with no less sincerity, thank you all who have helped throughout the year. Oh, yes, our attendances, excellent, even if we overlook February, lastly, thankyou to all those wonderful people who stepped in and assisted during my wife's serious illness.

Graeme C. Love
Chairman

FNCV Library Report 1987-88

The use of the Club library has been considerably curtailed this year, owing to the extensions to the Herbarium, which have required us to hold our meetings elsewhere than the conference room. As a result, since November members have been unable to have access to the library during meetings. However, up to that time members were using it regularly, and we have recorded 95 borrowings for the year. We have received nine inter-library loan requests, seven of which we were able to fulfill. We have also received several requests for assistance with historical research projects, relating to Club activities or individual members.

We have again received a number of donations, the chief of which was Madge Lester's gift of the bulk of her natural history library, with instructions that those books not required for the Club library were to be sold to members, and the proceeds to go to the Kinglake property fund: a gift which has benefitted the Club in several ways. We extend our thanks to Madge, who was Assistant Librarian for several years, and worked very hard after the last upheaval in the library; and we wish her well. Violet Balaam bequeathed books to the library, and we have also received donations from Trevor Hawkeswood, who sent us a copy of his **Beetles of Australia** (1987), and Margaret Dacy, with her **Victorian orchids in habitat** (1988). Altogether we have added 78 titles this year. Amongst these were **Flora of Australia v.45; Zoological catalogue of Australia, v.3 and 4;** Emison (and others) **Atlas of Victorian birds;** Bakker: **The dinosaur heresies;** White: **The greening of Gondwana.** We have also received a set of glass slides from Ina Watson.

Some work on sorting and listing archive material has taken place, though unfortunately not as much as was hoped.

The final event for the year in the library occurred on 9 April, when the entire stock was packed in boxes preparatory to being stored until we can move into new accommodation in the Astronomer's Residence. I thank the stalwarts who took part in this working bee, and also Olive O'Hagan, who has continued to help in the library throughout the year. Before packing, some books were removed for use of members attending Group meetings. Anyone requiring books should get in touch with Group secretaries, who may be able to help.

Sheila Houghton
Hon. Librarian

FNCV Microscopical Group Annual Report 1987-1988

Chairman, Mr Urwin Bates.

The groups membership has improved over the past twelve months.

New Members: Mr. Maurice Reager, Gary Richardson, Mrs. Mary Bates, Mr. N. Stanford, Sharon Leon.

Robert Dennis Graham, a member of many years, died at the Heidelberg Repatriation Hospital on the 6th November 1987, aged 62 years.

Dr. R. Hamond, although he resides in England, still has a genuine interest in the group's activities, he keeps in regular touch. Mr. Dawes on a visit to England in 1987 was warmly received by Dr. Hamond.

Professor Bolton has sent us a copy of his article on Ruling Engines which was published 1987 in the Journal, Historical Records of Australian Science. His article on Ruling Engines concerned Mr. Grayson and Mr. Shephard, once members of the F.N.C.V.

Mr. Gary Richardson, has skilfully made an excellent video film of 28 minutes duration, recorded with music on, How to get the best out of your microscope.

Donations of equipment were received from Mr. Nance, a former member of the microscopical group.

Meetings from November 1987 are to be held at the Astronomers Residence until further notice.

Lectures and Speakers for 1987-1988.

January was members night.

Mr. J. Dawes (3)	1. The Diatom Experts.
	2. History of Microscopes.
	3. Objectives and Eyepieces.
Mr. U. Bates (2)	1. Parastic Wasps.
	2. Making Your Own Microscope.
Dr. E. Peters (2)	1. Pond Life.
	2. Movie and Still Photography through the Microscope.
Mrs. B. Ward (1)	1. Display Night of Exceptional Slides from the Microscopical Group's Collection.
Mr. R. Power (1)	1. Aquatic Life.
Mr. R. Ward (1)	1. Ostracoda's.
Mr. N. Stanford (1)	1. Sections.

Mrs. E. C. Graham
Hon. Sec. of the Mircroscopical Group

FNCV Mammal Survey Group Annual Report 1987-88

Introduction

This report reviews the activities of the MSG from March 1987 to February 1988, during which the study permit No. 87-50 issued by the Division of National Parks and Wildlife was in force.

Administration

The following members were elected to the committee for 1988-1989.

Chairperson	William Farrugia
Honorary Secretary	Julian Grusovin
Treasurer	Ray Gibson
Records Officer	Peter Myroniuk
Newsletter Editor	Mibel Aguilar
Others	Tom Sault, Russell Thomson, Malcolm Turner.

Newsletter

A regular newsletter is produced monthly by the group. The newsletter, currently in its twelfth year of publication, keeps interested members informed on forthcoming meetings and speakers and field work. A summary of the previous months speakers' lecture is usually provided, as well as a report on recent field results. Items relevant to mammalogy as well as natural history and conservation in general are included from time to time.

Projects

The group is currently undertaking a number of projects:

1. Ecological Survey of Victoria. Field trips to various parts of the state are conducted as part

of our ongoing program. Trapping, spotlighting and examination of scats and skeletal material is performed to determine the mammalian fauna of the study area. Records are also made of reptiles, amphibians and birds present, as well as details of the habitat. Seven field trips have been conducted as part of this program.

2. Water-rat at MMBW Farm, Werribee. The distribution and ecology of the rodent *(Hydromys chrysogaster)* at the farm is being studied. This work is both novel and of use to the farm managers in their endeavours to conserve the Water rat on the farm. Seven surveys have been conducted on the farm to date, six during the period that this report covers.
3. The group is seeking funding from the Department of Conservation Forests and Lands in order to upgrade the slide library of mammals and make it more accessible, and also to purchase a computer for the storage of the group's extensive database of mammal trapping records.

Monthly Meetings

The group generally meets on the first Tuesday of the month and eleven meetings are held per annum.

The meetings are open to members, their guests and visitors. Average attendances have been 12 members and 2 visitors, this represents a 25% decline on previous years attendances.

Summary of Field Work

March: Strathbogie Ranges

Antechinus stuartii, Cercartetus nanus, Phascolarctos cinereus, Pseudocheirus peregrinus, Ovis aries, Macropus giganteus, Rattus fuscipes.

18-21 April: Goolengook River, East Gippsland

Rattus fuscipes, Antechinus stuartii, A. swainsonii, Trichosurus caninus, Eptesicus regulus, E. sagittula, Petaurus breviceps, P. australis, Vombatus ursinus, Perameles nasuta, Vulpes vulpes, Pseudocheirus peregrinus, Macropod sp.

6-8 June: Pyrete Range

Antechinus stuartii, Rattus fuscipes, Rattus rattus, Macropus giganteus, Pseudocheirus peregrinus, Phascolarctos cinereus, Oryctolagus cuniculus.

1-3 November: Sunday Island

Nyctophilus geoffroyi, Cercartetus nanus, Antechinus minimus, Wallabia bicolor, Hydromys chrysogaster, Oryctolagus cuniculus Hydrurga leptonyx.

27 December – 3 January: Dergholm

Chalinolobus gouldii, Antechinus flavipes, Rattus rattus, Rattus lutreolus, Pseudomys shortridgei, Cercartetus nanus, Mus musculus, Trichosurus vulpecula, Pseudocheirus peregrinus, Oryctolagus cuniculus, Macropus rufogriseus, M. fuliginosus.

25-26 January: Dargo High Plains

Rattus fuscipes, Antechinus stuartii, Mastacomys fuscus, Trichosurus caninus, Oryctolagus cuniculus, Vombatus ursinus, Tachyglossus aculeatus, Vulpes vulpes, Bos taurus.

At all surveys, the avifauna and herpefauna are also investigated.

Chance and incidental sightings made by members are also recorded. The 'Find of the Year Award' must go to Mr. Russell Thomson for locating the cranium and mandible of *Stenella attenuata* – the spotted dolphin; this is the first record of this genera for Victoria.

INSTRUCTIONS TO AUTHORS

The Victorian Naturalist invites contributions of original papers relating to Australian natural history, particularly of Victoria. All papers are assessed by an independent referee before publication.

Short contributions of natural history observations are also invited for use as "Naturalist Notes". These contributions may be edited, or excerpts published, at the Editors' discretion. Such notes are not normally refereed, and may be submitted more informally.

All contributions are to be written in concise, simple English.

For cost reasons, authors of original papers submitted for publication are requested to conform with the following guidelines. Any author who has difficulty in complying with these guidelines, or has queries concerning manuscripts, should consult the Editors before submitting a manuscript.

Submission of Manuscripts

Manuscripts should be sent to The Editorial Committee, Victorian Naturalist, F.N.C.V., C/- The National Herbarium of Victoria, Birdwood Ave., South Yarra, 3141

Two typewritten copies of the manuscript should be submitted. Authors are advised to retain a further copy.

Format

Text should be fully revised, typed double spaced on one side of the paper only, with a wide margin, pages numbered consecutively, and should conform in style to recent issues of the *Victorian Nat.*

Author's name and address or institution should appear beneath the title. Underline only those words to be italicised in the text i.e. genus and species names, and titles of periodicals and books. All measurements should be expressed in the metric system (SI units).

References should be cited in the text as Brown (1981) or (Brown, 1981). Footnotes must be avoided. Acknowledgements should be grouped at the end of the paper before References.

References should be listed alphabetically by author's surname at the end of the paper. All references should be cited in the text. Abbreviations of titles of periodicals should conform with those in *A World List of Scientific Periodicals* (4th ed., Butterworth). Refer to recent issues of the *Victorian Nat.* for the formatting of references.

Tables and Figures

Tables should only be used for essential data needed to show important points in the text. They should be numbered consecutively, referred to in order in the text, and designed to fit within the print area of 115 x 180 mm. Each table must have an explanatory caption.

Figures may be in the form of drawings or photographs. They should be identified on the back with the author's name and the figure number. The top should be indicated and the magnification by scale where appropriate. Compass directions must be indicated where necessary. All figures should be referred to in the text and numbered consecutively (Fig. 1, Fig. 2 etc.).

Figures should be carefully prepared and should be submitted ready for publication. Each should have a short caption. Maximum size is 115 x 180 mm; single column width is 55 mm. Figures are preferably submitted at actual size. Lettering on Figures should be done by the author; care is needed to ensure that all letters are legible after reduction.

Line drawings should be made in black ink.

Photographs should only be used where essential due to the high cost of printing plates. They should preferably be unmounted, glossy black & white prints, showing good detail and moderate contrast.

Proof and Reprints

Galley proofs will be sent to the author, who should correct and return them as soon as possible. Only the minimum of corrections should be made.

Multiple copies of articles can be prepared for the author only at the time of printing. These will be in the form of print run-ons and priced as follows for each multiple of 50 copies:

1-2 pp	3-4 pp	5-6 pp	7-8 pp	9-10 pp	11-12 pp	13-14 pp
$28	$35	$45	$55	$65	$75	$85

Orders for these 'reprints' must be made at the time authors return their corrected proofs to the editor.

Taxonomic Papers

Papers describing new taxa will not be accepted for publication unless the primary type material is deposited in a recognised public museum or herbarium.

It is suggested that in other more general papers where taxonomy is discussed, voucher material be lodged in a public collection, and the repository details cited in the text.

Special Note for Authors Using Wordprocessors

Many word processors and microcomputer floppy disks can now be transcribed directly to our printer's typesetting equipment, saving the effort and cost of rekeying.

Authors of papers which have been typed on a wordprocessor should tell the editor (at the time the paper is first submitted), what type of machine and wordprocessing software was used. Note that printed copy must still be submitted.

Queries can be directed to Russell Thomson, 17 Powlett Street, Heidelberg. 344 5713 (B.H.).

Continued from inside front cover.

GROUP MEETINGS (continued)

Day Group – Third Thursday

Thursday, 16 June, Meteorological Centre, Spring Street. Meet at the Conservatory, Fitzroy Gardens, 11.30 a.m. Leader: Andy Blackburn 379 8960.

Thursday, 21 July. Urban Forest, East Malvern. Meet at East Malvern station, 11.30 a.m. (Catch 11.02 a.m. train at Flinders Street station.) Leader: Dan McInnes 211 2427.

Thursday, 18 August. Yarra Bank Walk – Northern side. Meet at entrance of Concert Hall, 11.30 a.m. Leader: Joan Miller 836 2681.

Microscopical Group – Third Wednesday

Wednesday, 15 June. Preparation of Objects to be Examined Under the Microscope.

Wednesday, 20 July. Plant Histology and the Microscope.

Wednesday, 17 August. Marine Biology and the Microscope.

Mammal Survey Group – First Tuesday

Tuesday, 7 June. Members' Night.

Tuesday, 5 July. Workshop on Skeletal Identification. Lawrie Conole.

Tuesday, 2 August. "Hump Back Whales." Janet Lanyon.

Geology Group – First Wednesday

Wednesday, 6 July. "Solar Energy Before the Year 2000." Elizabeth Hauer.

Wednesday, 3 August. "Plate Tectonics and Australia." Gabi Love.

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursion.

Botany Group – Fourth Saturday

Saturday, 25 June. Botany of the Butterfly House, Melbourne Zoological Gardens. Leader: a zoo staff member.

Saturday, 23 July. Australian plantings and heathland at the Cranbourne Annexe of the Royal Botanic Gardens.

Saturday, 27 August. Courtney's Road Reserve, South Belgrave. Leader: Ilma Dunn.

Mammal Survey Group

Saturday, 11 – Monday, 13 June. Tallarook Forest.

Saturday, 25 – Sunday, 26 June. Water rats at Werribee.

Saturday, 9 July. Stag watching for Leadbeater's Possum.

Saturday, 23 – Sunday, 24 July. Water rats at Werribee.

Saturday, 13 August. Stag watching for Leadbeater's Possum.

Saturday, 27 – Sunday, 28 August. Water rats at Werribee.

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In which is incorporated the Microscopical Society of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

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The Victorian Naturalist

Vol. 105, No. 4

July/August 1988

Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

$3.50

GENERAL MEETINGS (Second Monday)

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria Street, Melbourne at 8 p.m..

Monday, 8 August
Mr I. Morrison "Orchids of Victoria". Honorary membership will be awarded to Mr. Ian (Dick) Morrison.

Monday, 12 September
Members' Night.

Monday, 10 October
Dr Tom Rich "Dinosaurs in Victoria". Honorary membership will be awarded to Mr. T. E. George.

FNCV EXCURSIONS (First Sunday)

Sunday, 7 August. Burnley Gardens. Meet at first carpark inside the entrance at 11 a.m. Bring lunch.

Sunday, 4 September. Gellibrand Hill Park and Greenvale Reservoir. Coach will leave Batman Ave. 9.30 am. Bring a picnic lunch. Bus fare $12.

Sunday 2 October. Brisbane Ranges. Coach leaves Batman Ave. 9.30 am. Bring a picnic lunch. Bus fare $14.

Thursday, 19-Friday 27 January. Kosciusko National Park and Canberra. Coach will depart Thursday morning, 19th, and we'll stay overnight at Corryong. Next morning we'll leave for Jindabyne, where we'll stay for three nights with day trips into Kosciusko National Park. On 23rd we'll travel to Canberra, remaining there till Friday 27th. We'll stay there four nights, and there will be day trips to places of interest. Accommodation: Dinner, bed and breakfast at Corryong and Jindabyne, and private hotel with bed and breakfast in Canberra (other meals are available). Cost: $520. $100 deposit when booking, and balance by 30 Nov. Bookings to Marie Allender, Excursions Secretary.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Avenue, South Yarra (150 metres nearer the Shrine than the Herbarium) at 8 p.m.

Botany Group – Second Thursday

Thursday, 11 August. "Some Problems for the Conservation of the Flora and Fauna of the Courtney's Road Reserve, South Belgrave". Garrique Pergel.

Thursday, 8 September. "Problems in Pea Flowers". Margaret Corrick.

Thursday, 13 October. "Orchids". George and Thelma Spice.

Day Group – Third Thursday

Thursday, 18 August. Yarra Bank Walk – Northern side. Meet at entrance of Concert Hall, 11.30 a.m. Leader: Joan Miller, 836 2681

Thursday, 15 Sept. Woodland Park, Essendon. Meet at Essendon station (east side) 11.30 a.m. (Catch 11.10 a.m. Flinders St.) Leader: Andy Blackburn, 379 8960.

Thursday, 20 October. Park Orchards, 100 Acres Flora and Fauna Reserve. 11 a.m. bus from Mitcham station (south side). (Catch 10.20 a.m. train from Flinders St.) Leader: Betty Gillespie, 578 1879.

Microscopical Group – Third Wednesday.

Wednesday, 17 August. Marine Biology and the Microscope.

Wednesday, 21 Sept. How to Make a Rock Section to Examine Under the Microscope. The Use of Polarised Light.

Wednesday, 19 October. Photography Through the Microscope. Microscope Life on Video.

Fauna Survey Group – First Tuesday

Tuesday, 6 September. "The Ecology and Conservation of the Long-Footed Potoroo". David Scotts.

Tuesday, 4 October.

Tuesday, 8 November.

Geology Group – First Wednesday

Wednesday, 7 September. "Chris Poole's Meteor Impact Theory Revisited".

Wednesday, 5 October. "Seismology in Australia". Gary Gibson.

Wednesday, 2 November. "Catastrophes, Extinctions and Evolution". Max Campbell.

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursions.

Botany Group – Fourth Saturday

Saturday, 27 August. Courtney's Road Reserve, South Belgrave. Leader: Ilma Dunn.

Saturday, 24 September. Orchids. The Common, Warrandyte State Park. Leader: Cecily Falkingham.

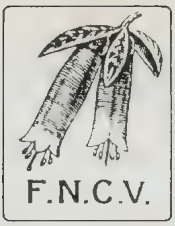
Saturday, 22 October. Flora Reserves and Railway Reserves. Remnant vegetation, Seymour Area. Leader: Peter Carwardine.

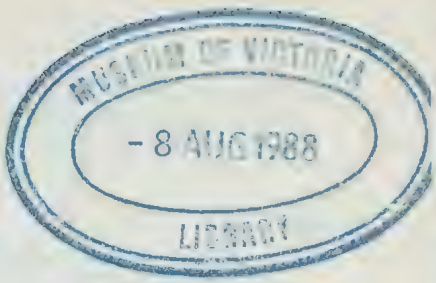
Fauna Survey Group

Saturday, 13 August. Stag watching for Leadbeater's Possum. Upper Yarra catchment.

Saturday, 27-Sunday, 28 August. Water Rats at Werribee.

Saturday, 29 October-Tuesday, 1 November. Inverleigh Common.





The Victorian Naturalist

Volume 105, Number 4

July / August, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Photo: The Paucident Planigale: a new record for Victoria (see page 81)

The History of Kangaroo Populations in Hattah-Kulkyne National Park, North-western Victoria.

By Graeme Coulson*

Introduction

Hattah-Kulkyne National Park and the neighbouring Murray-Kulkyne Park, in north-western Victoria (Fig. 1), were declared a Biosphere Reserve in 1982 by the United Nations Scientific and Cultural Organisation (Davis and Drake 1983). The two parks, referred to here as Hattah-Kulkyne, include riverine woodland on the floodplain of the Murray River, mallee shrubland on extensive dunefields, and stands of remnant *Callitris-Casuarina* woodland on open rolling dunes between the mallee and the riverine woodland. Hattah-Kulkyne has had a long history of exploitative land use (Cheal 1986; Walters 1986): the area has been heavily grazed by sheep, cattle and rabbits, while extensive clearing has removed many trees and shrubs, and has promoted grasslands; serious weed infestations and soil instability have developed, and many species of plants and animals have become rare or extinct.

One of the objectives of the current management plan for Hattah-Kulkyne is to reverse these trends and restore the parks to a condition as close as possible to that existing prior to European settlement (National Parks Service 1984). In addition to the ecological changes noted above, it has been suggested that the density of the kangaroo population at Hattah-Kulkyne increased after European settlement, and that there has been a consequent rise in the grazing pressure exerted by kangaroos to the extent that they now hinder attempts to rehabilitate the parks (National Parks Service 1984; Cheal 1986; Walters 1986). Accordingly, efforts have been made to reduce the population density of kangaroos in a badly degraded section of the park, as recounted by Cheal (1986). The aim of this paper is to evaluate the historical and scientific evidence for the proposition that the density of kangaroos has increased since settlement.

The early explorers

The first Europeans to see the Hattah-Kulkyne area were members of the expedition led by Captain Charles Sturt. In 1830, Sturt's expedition journeyed down the Murray River by boat, from the junction of the Murray with the Murrumbidgee (Fig. 1) to its termination in Lake Alexandrina, then rowed back upstream on the return journey. Sturt (1833) apparently saw few kangaroos from the river. His only direct reference to kangaroos along the Murray was to several he startled when he walked some distance from the river near present-day Waikerie, South Australia.

In 1836, an expedition led by Major Thomas Mitchell travelled by land along the New South Wales side of the Murray from the Murrumbidgee to the Darling (Fig. 1), then returned by the same route. Mitchell (1839) recorded many more observations of flora and fauna than did Sturt, and frequently mentioned kangaroos. He noted that they were particularly numerous along the lower reaches of the Darling, but made no specific reference to kangaroos in the Hattah-Kulkyne area where he became pre-occupied with increasing attention from Aborigines, culminating in the 'dispersion' of the natives by gunfire opposite Britt Bend (Fig. 1).

The first of the 'overlanders', Joseph Hawdon and Charles Bonney, followed Mitchell two years later in 1838. Hawdon and Bonney drove cattle along much of the course of the Murray from Albury to Adelaide. Between the Murrumbidgee and the Darling their party remained on the Victorian side of the river. About 120 km

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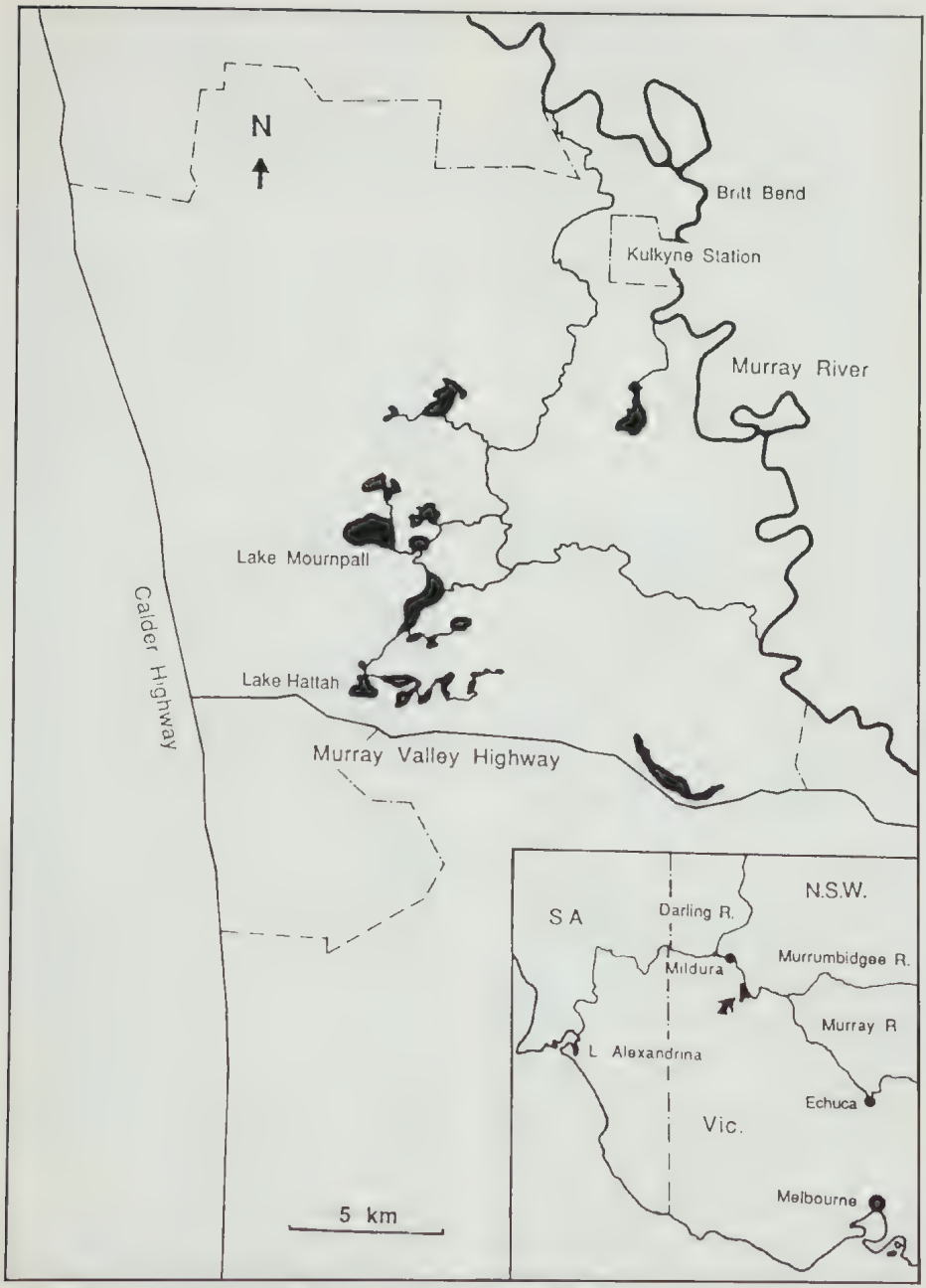

Fig. 1 Hattah-Kulkyne National Park and Murray Kulkyne Park, showing the lakes (shaded). The parks are largely bounded by the Calder Highway to the west, the Murray Valley Highway to the south, and the Murray River to the east. Other boundaries (__ . __ .) are shown. The inset shows the location of the parks (arrowed) in north-western Victoria.

downstream of the Murrumbidgee, Hawdon and a companion traced the channel of a water-course '...terminating in the dry beds of some extensive lakes...' (Hawdon 1952) and thus became the first Europeans to explore Hattah-Kulkyne. Although kangaroos were often mentioned elsewhere in Hawdon's (1952) journal, he made no reference to them at Hattah-Kulkyne, concentrating instead on a search for one of the members of the party and on the difficulty of driving the cattle through dense scrub.

The Blandowski expedition

More detailed records of the fauna were obtained during the scientific expedition led by William Blandowski in 1856-57. The expedition left Melbourne in December 1856 and travelled north-west via Echuca to 'Mondellimin' near the junction of the Murray and Darling Rivers (Fig. 1), where a permanent camp was established. Wakefield (1966) concluded that this encampment was at about the present location of Mildura, approximately 45 km north of Hattah-Kulkyne. Many specimens were collected from this general area, mainly by local Aborigines, from April to November, 1857. Blandowski made two lengthy forays alone to the west and north-east, then left 'Mondellimin' in August and returned to Melbourne. His account of the expedition (Blandowski 1858) gave little detail of the fauna recorded.

A second member of the expedition, Gerard Krefft, remained at 'Mondellimin' for a further three months after Blandowski's departure. Krefft kept detailed records of the species recorded by the expedition. His diary covered only the first part of the expedition, as far as Lake Boga (see Iredale and Whitley 1932), but his scientific paper (Krefft 1866) and his specimen catalogue and annotated list (see Wakefield 1966) provided the first comprehensive information on the distribution and status of the fauna of north-western Victoria.

Krefft (1866) recorded the Red Kangaroo, *Macropus rufus* (Desmarest), and grey kangaroos in the Mildura area. The specific identity of the grey kangaroos cannot be established with certainty because the specimens have been lost, but Krefft's use of the name 'Scrub Kangaroo' led Wakefield (1966) to conclude that most, if not all, were the Black-faced or Mallee Kangaroo (=Western Grey Kangaroo), *M. fuliginosus melanops* (Desmarest), as distinct from the Eastern Grey Kangaroo, *M. giganteus* Shaw. This conclusion is supported by the present distribution of the two species: the Western Grey Kangaroo is widespread in north-western Victoria and south-western New South Wales, while the Eastern Grey Kangaroo has been recorded there from only a few isolated localities (Caughley *et al.* 1984).

Krefft (1866) believed that, by the time of the expedition, the Macropodoidea (kangaroos and wallabies) had already declined in numbers along the Murray as a result of competition with cattle and sheep. Stock had been introduced to Hattah-Kulkyne ten years earlier when the 'Kulkyne' and 'Mournpool' runs were taken up in 1847 (Billis and Kenyon 1932). Although the Red Kangaroo had '... become very scarce...' in Victoria, the Western Grey Kangaroo was '...much more common...' (Krefft 1866) than the Red Kangaroo and was '...very common on both sides of the Murray...' (see Wakefield 1966). Of the smaller species of the Macropodoidea, the Bridled Nailtail Wallaby, *Onychogalea fraenata* Gould, was common (Krefft 1866; Wakefield 1966). Despite poisoning of the Dingo, *Canis familiaris dingo*, by settlers, Krefft (1866) considered it, the major non-human predator of kangaroos, to be plentiful along the Murray.

These observations of kangaroo numbers are at variance with others attributed to Krefft by the National Parks Service (1984) and Cheal (1986), which suggested that kangaroos were scarce in north-western Victoria in 1856-57. The discrepancy has arisen because the records of the Blandowski expedition were misinter-

preted; the comments cited by the National Parks Service (1984) and Cheal (1986) were taken from Krefft's diary, which was not kept beyond Lake Boga (130 km south-west of Hattah-Kulkyne) and which probably referred only to Eastern Grey Kangaroos.

The 1900's

The first scientist to record impressions specifically of Hattah-Kulkyne was J. G. O'Donoghue (1915), who visited the area in September 1914. At this time the area had experienced 12 months of the 1913-15 drought. O'Donoghue camped near Kulkyne Station for 10 days, venturing as far south as Lake Mournpall and Lake Hattah (Fig. 1). He visited the Raak area, to the west of Hattah-Kulkyne, in October of the following year after the drought had broken (O'Donoghue 1916). His narratives included a number of references to 'Black-faced' kangaroos, but made no comment on their abundance. No mention was made of Red Kangaroos or smaller macropodoids in Hattah-Kulkyne or Raak.

O'Donoghue made a number of observations on the European impact on Hattah-Kulkyne. His only reference to land-clearing was to stands of Black Box which had been felled or ring-barked, although wind erosion on dunes was mentioned. Failure of regeneration was evident at this early date: 'During all our extensive wanderings in Raak, as in the neighbourhood of Lake Mournpoul, not a single young plant, if we omit the Weeping Pittosporum, of any of the trees or shrubs met with was noticed' (O'Donoghue 1916). He also noted the effect of the drought on sheep and rabbits, and described the efforts to control rabbits by fencing and poisoning. Few of the predators of macropods remained: O'Donoghue apparently did not see a Dingo, although they were mentioned several times in passing, and the demise of the local Aboriginal population was recounted in detail.

The Kulkyne State Forest was declared in 1924 to ensure supplies of firewood, sleepers and *Callitris* posts. Hattah-Kulkyne then began to receive increasing attention from naturalists. Most of their descriptions of the area did not include kangaroos (Chandler 1938; Morrison 1941; Bryant 1943), although Jones (1942) noted that 'Mallee kangaroos' occurred in the riverine woodland and on the open dunes. Later, Jones (1952) reported a sighting of a group of Red Kangaroos in the Raak area.

Hattah Lakes National Park was declared in 1960. At that time, regeneration of *Callitris* and *Casuarina* evidently had not occurred due to grazing by rabbits, which were very common, and by domestic stock. The Western Grey Kangaroo was referred to as '...numerous...' and the Red Kangaroo was said to be present '...in small numbers...' (Victorian National Parks Association 1959). Descriptions of the new park (Garnett 1960; Jacobs 1963) mentioned kangaroos, but seemingly did not consider their numbers to be noteworthy. Eight years after its establishment, Anderson (1968) stated that Western Grey Kangaroos were '...quite common...' and that there was '...a small population of rarely more than 2 dozen...' Red Kangaroos in the park.

Population surveys

The first quantitative data on the population density of kangaroos in Hattah-Kulkyne were obtained by Cochrane and McDonald (1966). They surveyed an area of open dune and riverine woodland near Lake Hattah using counts of tracks and faecal pellets as simple indices of population density. Unfortunately, the area they surveyed was small, and their methods were insufficiently detailed to permit any meaningful comparison with the present population.

In 1980 Kulkyne State Forest and Hattah Lakes National Park were incorporated into the present Hattah-Kulkyne National Park and Murray-Kulkyne Park (National Parks Service 1984). In the same year the first census of kangaroos in the whole of the enlarged park was conducted

by aerial survey (Short and Grigg 1982) and three more surveys were made between 1982 and 1984, which indicated that the population density was at its highest at the beginning of the 1982-83 drought (see Walters 1986). Aerial surveys have since been superseded by ground surveys, which offer greater accuracy. The ground surveys began in 1983 and have continued annually (Morgan 1987). They confirm that the Western Grey Kangaroo is much more abundant than the Red Kangaroo, comprising about 95% of the total kangaroo population at Hattah-Kulkyne. The density of Western Grey Kangaroos has shown a gradual increase from 25 km^2 in 1983 to 36 km^2 in 1987, as the population recovered from the 1982-83 drought (Morgan 1987). These density estimates are mean values derived from transects through the full range of kangaroo habitats in the parks. They obscure the fact that some habitats, particularly open *Callitris-Casuarina* woodland, generally carry higher densities than others, such as mallee scrub. This variation limits the comparisons that can be drawn with equivalent estimates of overall density for the two similar parks in the region where long-term monitoring of kangaroo populations has been conducted. However, some indication of the relative density of the Hattah-Kulkyne population can be gained: the density of Western Grey Kangaroos at Wyperfeld National Park, north-western Victoria, ranged from 10 to 46 km^2 over a period of 14 years (Morgan 1986); at Kinchega National Park, south-western New South Wales, it ranged from 5 to 18 km^2 over 12 years (Bayliss 1987), and the park also carried Red Kangaroos at about three times this density.

Conclusion

There is no conclusive evidence for any change in the kangaroo population at Hattah-Kulkyne since European settlement. Western Grey Kangaroos were described as 'common' in the area in 1856 (see Wakefield 1966) and again almost 130 years later (Davis and Drake 1983). Equally, it cannot be concluded with certainty that the population density of kangaroos at Hattah-Kulkyne has remained essentially unchanged in the intervening time. Jarman and Johnson's (1977) analysis of bounty payments suggested that kangaroo populations in New South Wales initially rose after settlement then declined in the late 1800's, probably due to competition with rabbits and sheep. A similar process may have occurred during that period at Hattah-Kulkyne, but the published historical data are equivocal. Only scanty and subjective impressions of density are available for much of the period of interest. Quantitative data are quite recent, and show that the population density is within the range of fluctuations recorded in comparable parks.

This conclusion has implications for the management of Hattah-Kulkyne since neither the historical evidence or the recent scientific surveys provide a justification for reduction of the kangaroo population. However, comparisons of the present density of the Hattah-Kulkyne population with other populations in space and time have little bearing on the management problem. The issue is the degree to which the present population is hindering efforts to restore the parks. Decisions on population control must be based on data that are directly relevant to the management objective, which in this case can be obtained from studies of dietary preferences of the kangaroos (e.g. Norbury 1987) and studies of the responses of vegetation to grazing pressure (e.g. Mueck *et al.* 1984).

Acknowledgements

My thanks to Helen Coulson, who shared her knowledge of the Murray explorers, and to Andrew Bennett, who gave advice on faunal changes in the Mallee. I am also grateful to Angus Martin and Andrew Bennett for their helpful comments on the manuscript.

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Notes from the National Herbarium of Victoria – 7
Studies in *Isopogon* and *Petrophile* (Proteaceae)

By D. B. Foreman*

Introduction

Anybody who has walked through heath areas in Victoria or South Australia will no doubt have encountered the Horny Cone-bush, *Isopogon ceratophyllus* R.Br. This low growing plant with its pungent-pointed leaves and bright yellow flowers, which have contrasting crimson coloured bracts, is widespread and in some places is a dominant component of sandy heaths. (Fig. 1). However, despite having a great potential as ornamentals *Isopogon* and *Petrophile* species do not appear to be grown much and as a consequence remain relatively unknown to many people.

Fig. 1. *Isopogon ceratophyllus* growing in the Brisbane Ranges, Victoria.

Two Closely Related Genera

Isopogon and *Petrophile,* commonly known as Cone-bushes, Cone-flowers or Drumsticks, are two closely related genera which belong to the plant family Proteaceae. Many amateur and some professional botanists speak of these genera as though they were a single taxon and have often had difficultly distinguishing between the two genera. It it is not surprising that on more than one occasion it has been suggested that they could be combined into a single genus (see George, 1984).

Such has been the confusion that in 1830 Robert Brown gave the name *dubia* to a plant that he had described because he was uncertain whether or not it was an *Isopogon* or a *Petrophile;* he chose the latter. Another British Botanist Claridge

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Fig. 2. Distribution of *Isopogon* and *Petrophile* in Australia. The genera are coextensive.

Druce in 1917 was able to correctly assign the species to *Isopogon*.

Distribution and Size of the Genera

There are about 35 species of *Isopogon* and about 40 species of *Petrophile* all of which are confined to the southern part of Australia. The main centre of diversity for both genera is the south-west region of Western Australia (Fig. 2) where they are often a major component of the extensive heathlands in the area.

Origin and Meaning of the Names

The name *Isopogon* was first validly published by Joseph Knight in 1810 based on a manuscript name which had been used earlier by Robert Brown. The name refers to the coma or beard of silky hairs on the fruit and is derived from two Greek words, *isos* (meaning equal) and *pogon* (meaning beard).

The name *Petrophile* is also derived from two Greek words, *petra* (meaning a rock) and *phileo* (meaning to love) and refers to the rocky habitats from which some of the earliest known species were collected. Although Joseph Knight validly published the name *Petrophile* in 1809 it would appear to have been based on a Robert Brown manuscript name, *Petrophila*, which Brown did not validly publish until 1810. Many botanists of the day were somewhat angered by Knight's actions and did not recognise his work. Bentham (1870) in his account of the Proteaceae, in *Flora Australiensis*, uses the name *Petrophila* and this has been followed by various authors up to the present day. This has lead to the situation where the two names have been treated as alternatives and there has been some confusion as to which was the correct name. However, according to the recommendations set out in the *International Code of Botanical Nomenclature* (Voss et al., 1983) *Petrophile* has priority over *Petrophila* and should be used.

Morphology

All *Isopogon* and *Petrophile* species are shrubs ranging from more or less prostrate forms up to a maximum height of about 2 metres for *Isopogon* species and about 3.5 metres for *Petrophile* species. Both genera flower in spring or early summer and in large numbers or as isolated plants they make impressive displays.

The flowers of *Isopogon* species range in colour from cream to yellow or pink while those of *Petrophile* species vary in colour from cream to yellow or pink to mauve. Each flower consists of four segments which become recurved to expose the modified apical portion of the style which is called the pollen presenter.

Pollen Presenter

The term 'pollen presenter ' is used to describe the upper part of the style which can become swollen or modified in various ways. The pollen presenter is sometimes mistaken for the stigmatic surface which in most cases is comparatively small.

While the perianth segments are still held together pollen is shed from the anthers onto the pollen presenter. At this stage the stigmatic surface is not receptive. Once the perianth segments dehisce any pollinators visiting the inflorescence can pick up pollen from the pollen presenter and transfer it to another flower. Once the

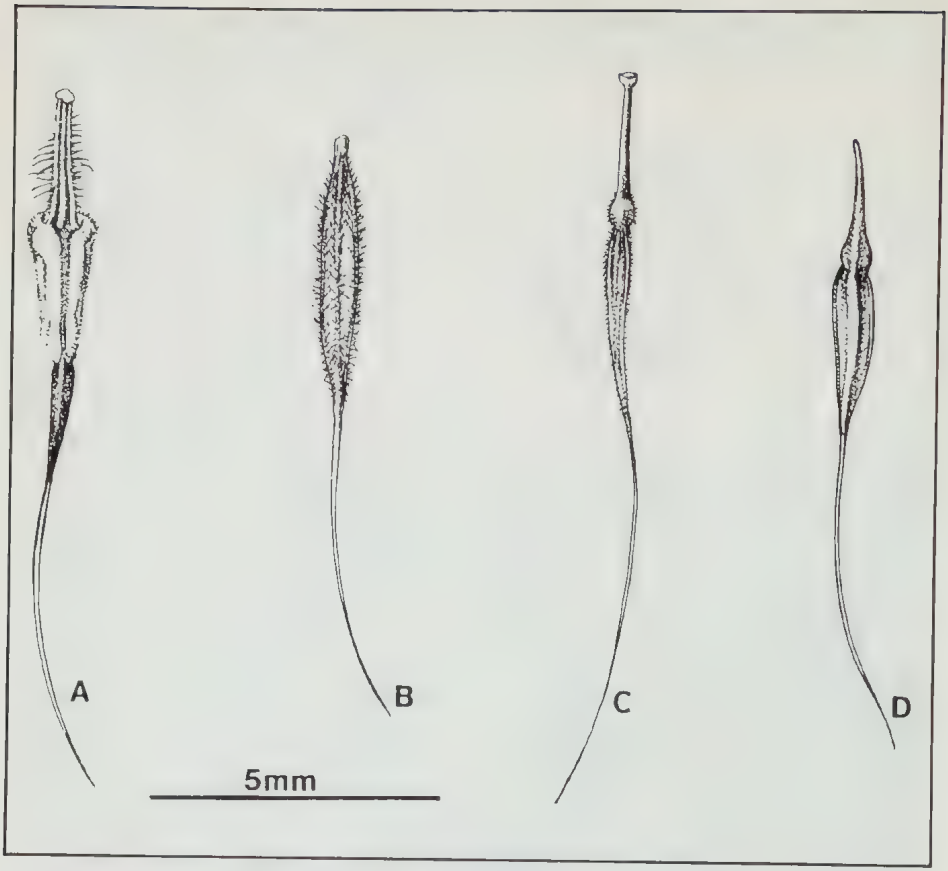

Fig. 3. Pollen presenters of various *Isopogon* and *Petrophile* species: (a) *Petrophile megalostegia* (West. Aust.); (b) *Petrophile shirleyae* (Qld); (c) *Isopogon dubius* (West. Aust.); (d) *Isopogon trilobus* (West. Aust.).

pollen has been removed from the pollen presenter the stigmatic surface becomes receptive. This mechanism prevents self pollination.

The pollen presenters seen in *Isopogon* and *Petrophile* are unlike those seen in other Proteaceae and have probably developed independently. Some *Isopogon* species have pollen presenters with characteristic constrictions and swellings while others are spindle-shaped. Various species of *Petrophile* have the upper part of the style truncated with the end portion elongated into a brush. Unfortunately for comparative purposes some *Petrophile* species also have spindle-shaped pollen presenters similar to those seen in *Isopogon*. The pollen presenters may be glabrous or have an indumentum usually of rather short, stiff hairs. (Fig. 3).

Amongst the most common types of modification to the apical portions of the styles in other genera of Proteaceae are either an expanded, more or less oblique disk or a cone-shaped structure. Both types are found in *Grevillea* and *Hakea* species and as in *Isopogon* and *Petrophile* the pollen presenters can be important features in identification.

Arrangement of Flowers

An examination of the inflorescences of *Isopogon* and *Petrophile* reveals another important feature in that the flowers are

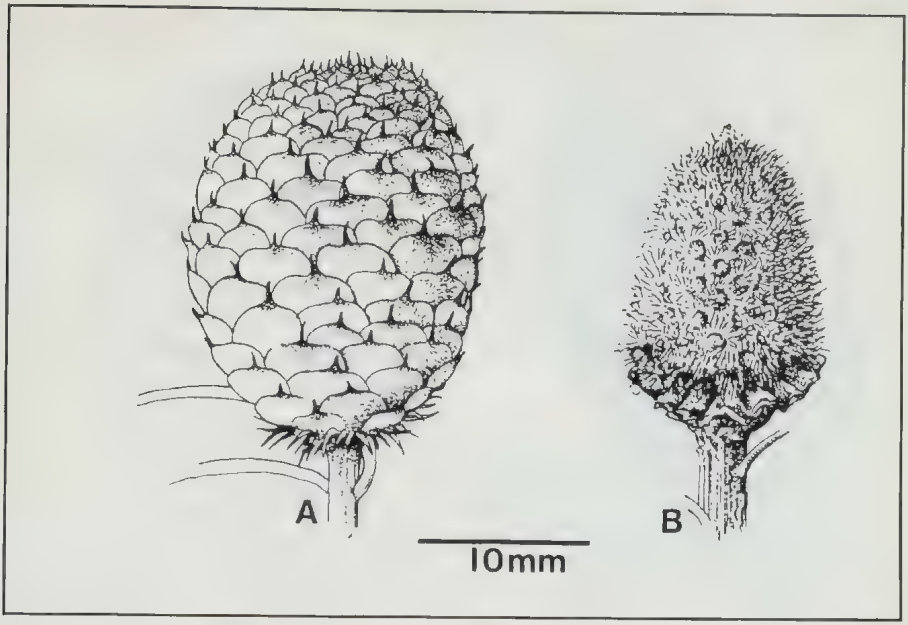

Fig. 4. *Isopogon prostratus* (a) mature infructescence; (b) central axis of infructescence after bracts and fruits have fallen.

not grouped in pairs as is seen, for example, in *Banksia, Grevillea* and *Hakea* species and indeed in most Australian genera. This feature along with characteristics of the fruit discussed below show that *Isopogon* and *Petrophile* belong to the subfamily Proteoideae within the family Proteaceae. Most other Australian Proteaceae genera have the flowers grouped in pairs and belong to the subfamily Grevilleoideae.

'Cones' and Fruits

Both *Isopogon* and *Petrophile* have characteristic cone-like infructescences which gives rise to the common name Cone-bushes. It is the nature of these structures which provides one of the main features used to distinguish *Isopogon* from *Petrophile.* In *Isopogon* the bracts subtending the fruit remain comparatively soft and fall away at the same time as the individual fruits leaving a rather soft, central column of tissue which quickly breaks down. (Fig 4 a and b). However, in *Petrophile* the bracts and central axis become woody (Fig. 5 a and b) and the infructescences persist for some time on the shrub even after the individual fruits have been released. (Fig. 5 c). Some people erroneously refer to the individual fruits as the 'seeds' and the infructescence as the 'fruit'.

Distribution in Victoria

Although there are at least four widespread *Petrophile* species in New South Wales, which extend to either the southern tablelands or the south coast regions of the state, none of them is known to occur naturally in Victoria. Interestingly there is one species, *Petrophile multisecta* F. Muell., which is endemic to Kangaroo Island in South Australia. This species appears to be more closely related to Western Australian species such as *Petrophile conifera* Meisn. rather than any of the eastern Australian taxa. The occurrence of *P. multisecta* on Kangaroo Island is probably best regarded as a relict from a time when the genus as a whole was more widely distributed.

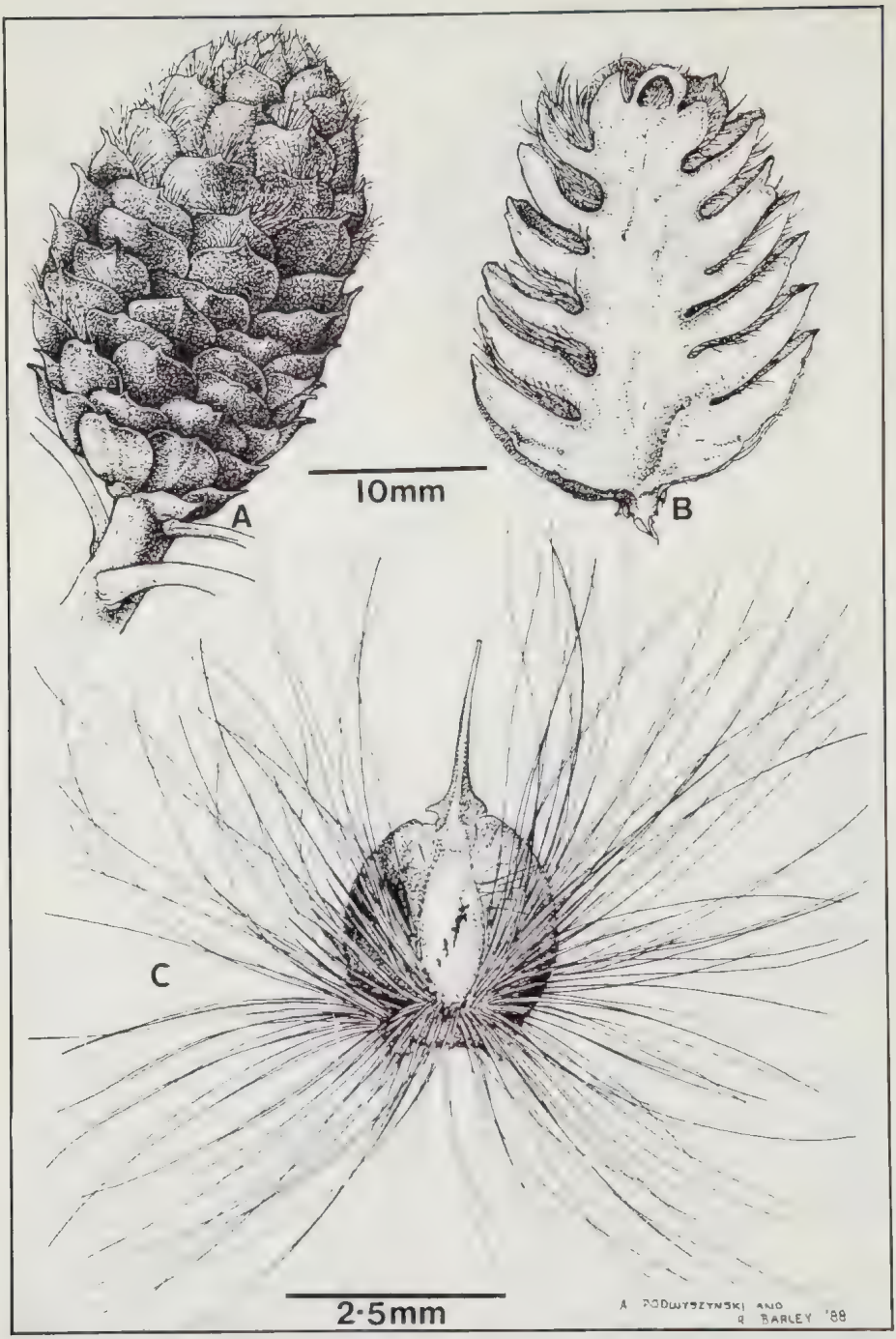

Fig. 5. *Petrophile sessilis* (a) mature infructescence; (b) section through mature infructescence; (c) mature fruit.

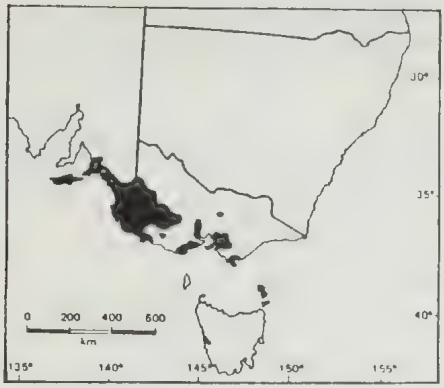

Fig. 6. Distribution of *Isopogon ceratophyllus*.

As mentioned previously *Isopogon ceratophyllus* is widespread in Victoria and South Australia. Although it does not extend into New South Wales it has been found on a number of the eastern islands of Bass Strait. (Fig. 6).

The only other species which occurs in Victoria is referred to by Willis (1972) as *Isopogon anemonifolius* (Salisb.) Knight var. *tenuifolius* F. Muell. ex Benth. The varietal name refers to the short, narrow-linear segments of the leaves. D. McGillivray (1975), working at the National Herbarium of New South Wales, raised the taxon to species level and proposed the new epithet *prostratus* in reference to the prostrate habit of the species.

An Endangered Species

Isopogon prostratus McGillivray (Fig. 7) is widespread on the southern tablelands and the south coast of New South Wales. However, the only Victorian specimens, at the National Herbarium of Victoria, of *Isopogon prostratus* all come from near Fernbank in East Gippsland where plants

Fig. 7. Habit study of *Isopogon prostratus*.

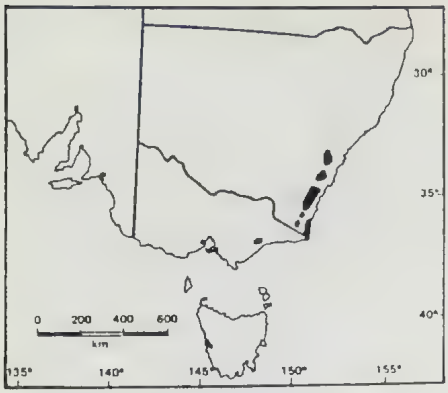

Fig. 8. Distribution of *Isopogon prostratus*.

are found growing on deep sands in open woodlands or heaths (Fig. 8).

Previously a number of scattered populations were known to occur beside the railway line near Fernbank. In recent times these have been disturbed by continued clearing and burning activities. Fortunately *Isopogon prostratus* continues to exist in an area of land adjacent to the railway reserve.

Although we have no specimens to support the claim it is possible that *Isopogon prostratus* may exist in other areas of Victoria, for example, around Mallacoota. Any sightings, supported by properly vouchered specimens, can be reported to the author. In the meantime *Isopogon prostratus* should be regarded as an endangered species in Victoria.

Acknowledgements

Thanks are due to Anita Podwyszynski and Richard Barley for the illustrations and to Karen Wilson for assistance with Figure 1.

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First Record of the Paucident Planigale, *Planigale gilesi* (Marsupialia: Dasyuridae), for Victoria.

BY L. F. LUMSDEN*, A. F. BENNETT* AND P. ROBERTSON*

Introduction

The Paucident Planigale, *Planigale gilesi,* (Fig. 1) is a small carnivorous marsupial which occurs in the arid and semi-arid regions of eastern Australia (Fig. 2). The species was first described in 1972, and named in honour of the explorer Ernest Giles, 'the most intrepid of Australian explorers and, like this planigale, an accomplished survivor in deserts' (Aitken, 1972). Studies of the biology of this species include observations on its ecology (Denny, 1975, 1982); behaviour (Andrew and Settle, 1982); breeding (Whitford et al., 1982; Read, 1984a); movements and home range (Read, 1982; 1984b); diet (Read, 1987); and trappability (Read, 1985).

During a recent survey of the fauna of the mallee region of north-western Victoria, *P. gilesi* was recorded for the first time in this State. We report here on the occurrence of this species in Victoria.

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Methods

An extensive survey of the vertebrate fauna of the Mallee Area of Victoria, as defined by the Land Conservation Council (LCC, 1987), was conducted during 1985-87 by the National Parks and Wildlife Division, Department of Conservation, Forests and Lands (DCFL). One hundred and twenty permanent survey sites were established and the fauna at these sites was monitored seasonally; additional sites in other areas were surveyed once. The permanent sites were located in order to sample fauna from the range of vegetation communities and land systems present in the area.

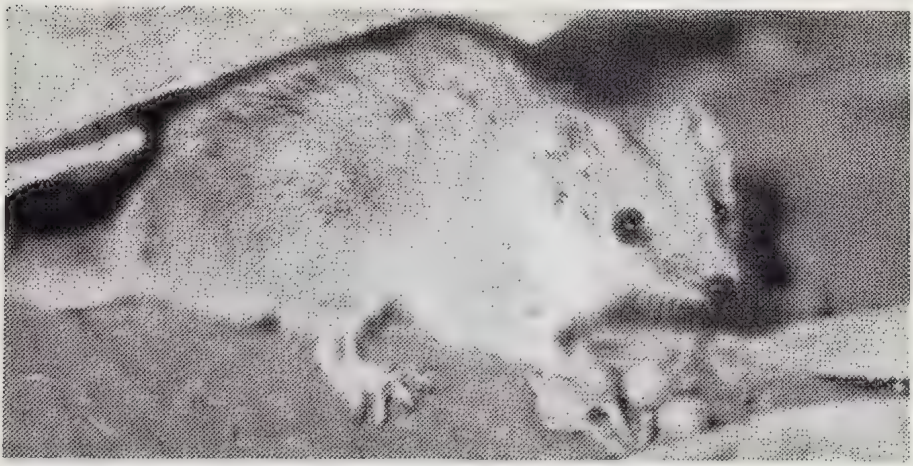

Fig. 1. The Paucident Planigale *Planigale gilesi* - first recorded in Victoria in 1985

At each site, small terrestrial vertebrates were sampled in two ways. Firstly, a pitfall and drift-fence system was installed, comprising 10 buckets (40 cm deep) set in the ground at regular intervals along a 50 m drift-fence of fibreglass flywire mesh (approx. 15 cm high); the pits were not baited. Secondly, at permanent sites only, six cage traps (36 x 20 x 16 cm), six Elliott aluminium traps (10 x 10 x 33 cm) and a

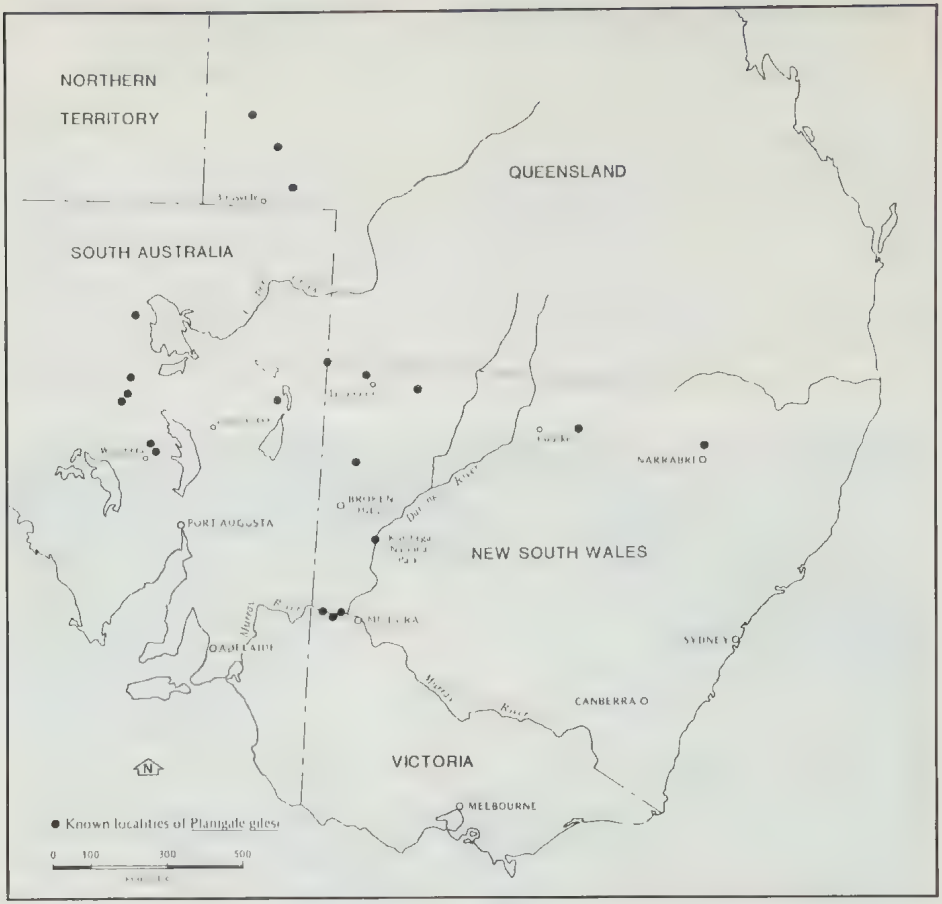

Fig. 2. Known distribution of *Planigale gilesi* in Australia.

funnel trap (30 x 30 x 90 cm) were set along 100 m of drift-fence. These traps were baited with a mixture of rolled oats, peanut butter, honey and sunflower seeds. At permanent sites pitfall traps were open for five consecutive nights during each of five seasonal samples over an 18 month period. At the additional sites, the pitfall traps were open for seven nights. Sampling effort with pitfall traps at each site at which *P. gilesi* was captured is summarised in Table 1.

Vegetation at the permanent sites was assessed by the Public Lands and Forests Division of DCFL, and sites were assigned to one of the floristic vegetation communities described by LCC (1987).

Results

During the survey, 13 *P. gilesi* were captured at seven sites in three localities: north of Cullulleraine (sites A and B); Lindsay Island (sites C and D); and Wallpolla Island (sites E,F and G) (Fig. 3). All the sites were on the southeastern edge of the arid zone and receive a mean annual rainfall of less than 250 mm. These sites are subject to infrequent inundation by flood waters.

The location and a description of the vegetation, soil, and other small mammals captured at each site from which *P. gilesi* was recorded in Victoria are given in Table 1. All seven sites were on alluvial flood-

Table 1. Captures and characteristics of capture sites at which *Planigale gilesi* was recorded in north-western Victoria. The soil at all sites was a grey cracking clay.

Site and Locality	*Habitat*	*No. of pitfall trapnights*	*No. of captures of P. gilesi* (captures per 100 pitfall trapnights)	*Other small mammals*
Nth. of Cullulleraine				
A. 34°12'S, 141°35'E	*Eucalyptus largiflorens* woodland with large clumps of *Muehlenbeckia cunninghamii* and *Chenopodium nitrariaceum*	250	3 (1.2)	*Sminthopsis crassicaudata* *Mus musculus*
B. 34°12'S, 141°36'E	Saltbush Shrubland dominated by *Atriplex nummularia*	250	3 (1.2)	*S. crassicaudata* *M. musculus*
Lindsay Island				
C. 34°07'S, 141°12'E	*M. cunninghamii* shrubland adjacent to *E. largiflorens* woodland	200	2 (1.0)	*M. musculus*
D. 34°07'S, 141°11'E	*E. largiflorens* woodland with *M. cunninghamii* and *C. nitrariaceum*	200	2 (1.0)	*M. musculus*
Wallpolla Island				
E. 34°07'S, 141°46'E	*M. cunninghamii* shrubland adjacent to *E. largiflorens* woodland	70	1 (1.4)	*M. musculus*
F. 34°07'S, 141°46'E	*E. largiflorens* woodland with sparse *M. cunninghamii* and shrubs	70	1 (1.4)	*M. musculus*
G. 37°07'S, 141°46'E	*E. largiflorens* woodland with *M. cunninghamii*	70	1 (1.4)	*M. musculus*

plains with grey cracking clay soils, and within several kilometres of the Murray River. Six sites were in Black Box Chenopod Woodland (Fig. 4), and the seventh was in nearby Alluvial Plain Shrubland (see LCC, 1987 for full floristic descriptions of these vegetation communities). Vegetation at the sites of capture consisted of patchy, but dense, ground cover dominated by Tangled Lignum *Muehlenbeckia cunninghamii,* Nitre Goosefoot *Chenopodium nitrariaceum* or Old-man Saltbush *Atriplex nummularia.*

Details of the sex, age and weight, and some other measurements of the 13 animals captured are presented in Table 2, with specimen numbers (Museum of Victoria) for those individuals retained. Captures were predominantly of males (11 individuals), and nine animals (including both females) were considered to be sub-adults. *P. gilesi* were caught during all seasons of the year, but sub-adults were recorded only in February, March and June. There was considerable variation in weather conditions at the times when *P. gilesi* was captured. Overnight minimum temperatures ranged from 0 to 14 °C, and rain, cloud cover and phase of the moon varied markedly.

All of the *P. gilesi* were caught in pitfall traps, despite a survey effort of 276 cage, 276 Elliott and 46 funnel trap-nights conducted at the same sites. The mean capture rate (at sites where *P. gilesi* was recorded) was low (1.2 captures per 100 pitfall trapnights, where one pitfall trap-night equals one pit open for one night). Other small mammals trapped at the sites were the Fat-tailed Dunnart *Sminthopsis crassicaudata* and the introduced House Mouse *Mus musculus* (Table 1).

Table 2. Details of individual *Planigale gilesi* captured in north-western Victoria.

Date of Capture	*Site* (see Fig.1)	*Weight* (g)	*Measurements* (mm) Total Length	Tail	Hindfoot	Scrotal Width	*Museum Specimen Number*
Males (adult)							
14.11.85	A	12	148	65	11	8	C27302
17.11.85	A	9	125	59	12	10	C27300
18.10.86	B	10.8				10	
22.02.87	A	9.2		62	11	10	
Males (subadult)							
19.02.86	C	5.5	118	63	11	4	C27301
20.02.86	D	5.2					
23.02.86	B	6.0				4	
21.06.86	B	6.3	121	62	10	9	C27303
23.06.86	D	5.8				8	
25.03.87	F	5.0	112	52	10	4	
26.03.87	G	6.0	124	59	10	5	
Females (subadult -undeveloped pouch)							
21.02.87	C	5.8		54	11		
25.03.87	E	5.4	122	58	11		

Discussion

The capture of *P.gilesi* in north-western Victoria extends the known range of this species some 200 km further south than the previous southernmost record at Kinchega National Park, NSW (Fig. 2). Throughout its range in arid and semi-arid areas of eastern Australia, *P. gilesi* appears to occur mainly in the more mesic areas, such as the floodplains of creeks and swamps, beside lakes and bore drains, and in interdune areas (Denny, 1982). Andrew and Settle (1982) have demonstrated a close relationship between the occurrence of *P. gilesi* and the presence of grey, brown and red clay soils which are characterised by their deep cracks and gilgai formations. These soil types are widespread in inland eastern Australia (see map in Andrew and Settle, 1982) and include a continuous band from the Murray River along the Darling River to Kinchega National Park.

These recent records of *P. gilesi* from Victoria also conform to this distributional pattern. Individuals were captured only on alluvial floodplains adjacent to the Murray River on grey, cracking clay soils. *P. gilesi* was not caught at adjacent sites which had different soil types or vegetation communities, (e.g. River Red Gum Forests, which have a predominantly grassy understorey; and Alluvial Rise Shrubland). The floodplains of the Murray River downstream of its junction with the Darling River may constitute the entire range of this species in Victoria; no *P. gilesi* were caught at two comparable sites located in similar habitat further upstream, at Liparoo State Forest (Fig. 3).

Cracks in the clay soil appear to be an important feature of the habitat for *P. gilesi* (Read, 1983) because they provide protection from extremes of temperature and from predators. The flattened body form and the oblique movement of the limbs of this species allow access to narrow spaces. The clumped dense understorey would also offer *P. gilesi* some protection from predators (Aitken, 1972).

At Fowlers Gap, NSW, *P. gilesi* has an extended, but seasonal, breeding period from July to January, and juveniles and sub-adults have been recorded from November to June (Read, 1984a). Juveniles take 5-6 months to reach adult proportions (Whitford et al., 1982). In Victoria, sub-adults were trapped during February, March and June, which is consistent with

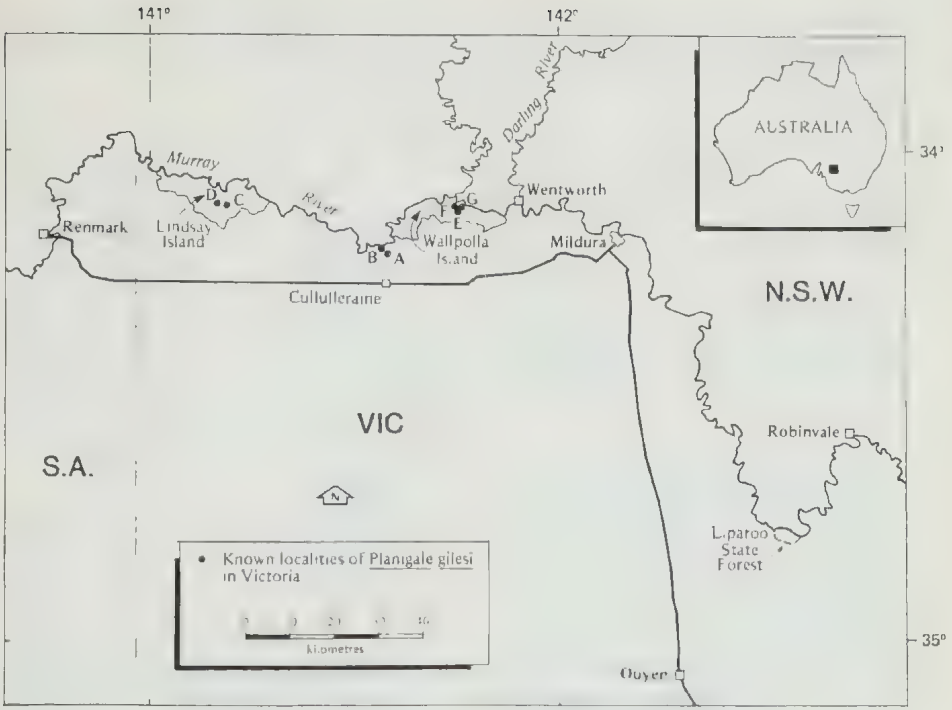

Fig. 3. Known occurrences of *Planigale gilesi* in Victoria.

Fig. 4. Black Box Chenopod Woodland with understorey of Tangled Lignum - habitat of *Planigale gilesi*. The pitfall trapline can be seen in the centre of this photograph.

the breeding season recorded by Read (1984a). Scrotal development of males (Table 2) follows the pattern found by Read (1984a).

The skewed sex ratio observed in *P. gilesi* in the present study may reflect different movements by males and females. Read (1984b), who also caught significantly more males than females, found that although individuals of both sexes had shifting home ranges, on average, males tended to have moved greater distances than females between captures. Males may therefore be more likely to encounter traps than are females.

During this survey *P. gilesi* was caught only in pitfall traps. Others (Aitken, 1972; Denny, 1975; Read, 1985) have caught *P. gilesi* in Elliott traps, but these are not as reliable as pitfall traps for detecting this species (Read, 1985). Success rates with pitfall traps in Victoria are comparable to those obtained by Read (1985).

P. gilesi was trapped when overnight minimum temperatures ranged from 0-14°C; in contrast Andrew and Settle (1982) trapped *P. gilesi* only when overnight temperatures were above 19.8°C. Denny (1982) found that during winter, *P. gilesi* were active during the day, and rarely active at night. Hence, it is possible that in this study *P. gilesi* may have been captured while active during the day when maximium temperatures were above 14°C.

None of the localities from which *P. gilesi* has been recorded in north-western Victoria are within a conservation reserve. The area north of Cullulleraine is uncommitted public land, and Lindsay Island and Wallpolla Island are presently zoned for hardwood production (LCC, 1977). Timber harvesting in these areas is primarily in River Red Gum forests, but Black Box woodlands have been selectively logged in the past, and the commercial collection of firewood continues. All three localities are grazed by domestic stock. The effects of these practices on populations of *P. gilesi* are not known. Land use in the mallee region is currently under review (LCC, 1987) and consideration should be given to the conservation of this small marsupial.

Acknowledgements

We wish to thank Peter Johnson and Graham Milledge for assistance in the field, and Martin Batt for drawing the figures. Darwin Evans, Peter Menkhorst, John Seebeck and Bob Warneke provided useful comments on the draft. For records of the distribution of *P. gilesi* we are grateful to Catherine Kemper (South Australian Museum), Linda Gibson (Australian Museum), Steve van Dyck (Queensland Museum) and Liz Dovey (N.S.W. National Parks and Wildlife Service). Animals were trapped under Permit No. 86/31 from the National Parks and Wildlife Division, Victoria.

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Southern Bottle-nose Whales *(Hyperoodon planifrons)* seen off Wollongong, NSW

BY MILTON LEWIS*

On the 30 February 1988, about 29 kilometres ENE of Wollongong NSW (34°19′53″S, 151°12′23″E) in a depth of 85 metres, two groups of Southern Bottle-nosed Whales *Hyperoodon planifrons)* were sighted.

At 1100 hours, the first group, containing two adults and a calf were seen spouting and moving in a general southerly direction. As the vessel approached within about 200 metres they dived for a period of three minutes to again surface about 700 metres south of our position. They continued this sequence another three times with dive periods of two-three minutes.

The second group was encountered at 1130 hours in close proximity to the first, which at this stage had dived from view. We did not directly approach this group, but positioned the vessel within their oncoming path and waited until they came to us. This method was very effective, with the group of eight surfacing about 20 metres away. During observation, the group stayed close together, milling around the same area for about four minutes, repeatedly diving just beneath the surface. From the behaviour exhibited by these individuals we concluded that they were actively feeding, which resulted in very clear views of all the body.

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Animals observed in the second group were six to eight meteres in total length. The melon of the head was well developed in all individuals and covered in large white scars. Head colour was glaucaus (Smithe 1975, colour 80), turning to pale neutral grey (Smithe 1975, colour 86), over the dorsal surface of the body. Ventrally the body was much paler. The dorsal fin was very pronounced and placed about two-thirds back along the body. Some individuals had heavily curved dorsal fins. The beak was well pronounced in all the individuals, giving them a very bottlenosed appearance. When spouting, the blow was anteriorly directed at an angle of about 40°. The heavy melon head and pronounced scars probably shows that this was a herd of male Southern Bottle-nosed Whales (Watson 1981).

The Bottle-nosed Whale is rare in Australia, having been recorded from only four strandings (Baker, 1983). Watson (1981) goes further, classifying this species as rare over its entire range. To the best of my knowledge this situation has not changed.

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Some Foliage Insects of *Racosperma longifolia* (Andr.) L. Pedley (Mimosaceae) in New South Wales

BY G. A. WEBB*

Abstract

Beetles recorded from *Racosperma longifolia* foliage at two sites in coastal New South Wales are listed. Two wasps (Ichneumonidae) are also recorded. The biological associations of these insects with *R. longifolia* are discussed.

Introduction

Racosperma longifolia (Andr.) L. Pedley is a variable sized shrub of eastern New South Wales. Two subspecies, *longifolia* and *sophorae* are currently recognised (Jacobs and Pickard 1981), the latter occurring primarily on coastal sand dunes and the former in a wide variety of habitats from coastal dunes to tall eucalypt forests (Beadle *et al* 1983).

Hawkswood (1981) described aspects of the biology of three species of Buprestidae found on *R. longifolia* (var. *sophorae)* foliage at Coffs Harbour (New South Wales), however few other comprehensive data on insects associated with *R. longifolia* are available. Hawkeswood (1978) and Williams and Williams (1983) recorded various Buprestidae from the foliage of *R. longifolia* while some wood-boring Coleoptera have been reared from *R. longifolia* timber (Froggatt 1895, Hawkeswood and Peterson 1982, Webb 1987, Williams 1985).

This paper presents data on beetles and wasps recorded from the foliage of *R. longifolia* (var. *longifolia)* at Shoalhaven Heads and Como (a suburb of Sydney), New South Wales, during 1986.

Study Areas and Methods

On 23 January 1986 at Shoalhaven Heads (34°51'S 150°44'E) insects were observed on and collected from the foliage and branches of *R. longifolia* plants scattered along a roadside.

On 25 and 31 October 1986, at Como (34°01'S 151°04'E) *R. longifolia* plants on the edge of a tidal mangrove creek were examined. Insects were observed on and collected from the foliage and branches.

Beetles were captured by hand, stored in plastic bags and returned to the laboratory for identification. On all three days of observation the weather was fine and temperature 25-30°C. *R. longifolia* plants were not flowering at either locality.

Results and Discussion

17 species representing 10 families of Coleoptera were recorded from the foliage and stems of *R. longifolia* at the two sites (Table 1).

Hawkeswood (1978, 1981) and Williams and Williams (1983) also list *Melobasis cupriceps* Kirby, *Melobasis purpurescens* F., *Cisseus leucosticta* (Kirby), *Cisseus acuducta* (Kirby), *Cisseus aurocyanea* Carter, two unidentified *Cisseus* and *Nascioides carissima* Waterhouse (all Buprestidae) from *R. longifolia* foliage.

Most beetles were found resting on stems or phyllodes. Three species were observed feeding on the foliage. *Ancita lineola* Newman (Cerambycidae), *Perperus* sp. (Curculionidae) and *Belus semipunctata* (F.) (Belidae) were all observed to feed on foliage by chewing on the edge of phyllodes. Hawkeswood (1981) observed *Cisseus scabrulosa* Kerremans feeding on *R. longifolia* (var. *sophorae)* phyllodes and attributed much of the phyllode damage observed to this species, *Agrilus australasiae* Laport and Gory (Buprestidae) and an unidentified *Cisseus* species (Buprestidae). While *C. scabrulosa* and *Cisseus cupripennis* Guerin were not observed feeding on *R. longifolia* phyl-

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lodes in this study it would appear likely that they were. Together with the other recorded folivores they caused significant damage to some plants, particularly at Como.

R. longifolia has also been recorded as a larval host of *A. lineola, B. semipunctata* and *C. scabrosula* (Froggatt 1895, Webb, unpubl. data). As well as feeding on foliage, the adults may also have been present for the purpose of breeding and oviposition, though neither activity was observed for these three species. Copulating pairs of *C. cupripennis* and *Perperus* sp. were observed on *R. longifolia* at Shoalhaven Heads but females of neither were observed ovipositing.

The Elaterid *Crepidomenus luteipes* Boh. was observed feeding on exudate from extra-floral nectaries located on the edge near the base of the phyllode. This would appear to be first record of elaterids using extra-floral nectaries. Boughton (1981) observed ladybirds (presumably coccinellids) at nectaries but as far as I am aware there are no other records of Coleoptera attending the extra-floral nectaries of Australian *Acacia (sensu lato).* In Australia, ants and birds have only occasionally been observed at extra floral nectaries (Boughton 1981, 1985) unlike elsewhere (Bentley 1983).

Two ichneumonid wasps, *Echthromorpha intricata* (F.) and *Xanthopimpla* sp. were also observed on *R. Longifolia* foliage at Shoalhaven Heads. As both are

Table 1: Coleoptera recorded from *R. longifolia* foliage.

		Shoalhaven Heads	Como
Scarabaeidae			
Heteronyx sp.	?F	*	
Buprestidae			
Cisseus cupripennis Guerin	F,W	*	*
Cisseus scabrulosa Kerremans	F,W	*	*
Elateridae			
Crepidomenus luteipes Boheman	N		*
Cantharidae			
Chauliognathus pulchellus Macleay	?P	*	*
Coccinellidae			
Dionus notescens (Blackburn)	P	*	
Harmonia conformis Boisduval	P		*
Rhyzobius sp.	P	*	
Cerambycidae			
Ancita lineola Newman	F,W	*	*
Aridaeus thoracicus Donovan	?F,?W	*	
Chrysomelidae			
Pyrgoides sp.	F		*
Apionidae			
Mymacicelus formicarius Chevrolat	F,?W		*
Belidae			
Belus semipunctata (Fabricius)	F,W	*	
Curculionidae			
Chrysolopus spectabilis (Fabricius)	F,W	*	*
Perperus sp.	F,?W	*	
sp.	F		*

F = folivore
N = nectivore
P = predator
W = wood-borer

obligate parasites of Lepidoptera (Gauld 1984), they were probably searching for host larvae.

Acknowledgements

Mr Graham Brown (N.S.W. Dept. Agriculture) and Dr. Andrew Calder (Australian National Insect Collection) kindly identified the ichneumonid wasps and elaterid beetles respectively.

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The following is a list of the works by the late *Gordon Beaton* in collaboration with various other authors. *Gordon*, a long time member of the Field Naturalists Club of Victoria, took up the study of fungi relatively late in life. Although lacking any formal scientific training, the thoroughness and exactitude of his microscopic examinations, descriptions and drawings of whatever he himself discovered or had drawn to his attention, is evident in all his published works.

G. A. Chrichton

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Victorian Field Naturalists Clubs Association

A meeting of the Victorian Field Naturalists Clubs Association was held at "Kangaroobie" Host Farm at Princeton March 11th to 14th (Labour Day Weekend) 1988.

Approximately 53 people attended from seven Victorian Clubs. The program was arranged by the Timboon Club, Mr. Mark Tribe acting as President and Mrs. Nancy Bryant as Secretary. A varied and exciting program was enjoyed by all, but the weather was wet and windy as befits that great torn coastal line between Cape Otway and Warrnambool, where so many shipwrecks have occurred since 1839 when the first immigrant ship from Britain arrived in Hobsons Bay after negotiating that coastline.

Many lives were lost from the 18 ships which were lost at the Western entrance to Bass Strait between Cape Otway and King Island, most of these were sailing vessels which were unable to manoeuvre away from the land because of the terrible strength of the onshore wind. The members of the Camp-out felt its fury at this meeting and let their imaginations run riot at Loch Ard Gorge where the beautiful sailing ship fouled the Mutton Bird Island reef at 4 a.m. on a cold morning June 1st 1878, with the loss of 52 lives. We saw Eva Carmichael's Cave and where Tom Pearce, the 18 year old apprentice who rescued Eva (aged 19), climbed the cliffs and went for help to Gleample Station some 5½ kilometres to the east, a run taken by James Brown in 1840 and owned by Hugh Gibson at the time of the disaster.

Our program took us in by many tracks along the coast to see the offshore stacks, including the Arch, 12 Apostles, London Bridge, 10 Chain Reef, Nenfield, the Bay of Islands and Moonlight Head, and we watched the mutton birds returning to Mutton Bird Island at dusk. Bill O'Shea helped by leading us along the coast, he had recently been employed at making a coastal walk from Portland through to Anglesea, often along the precipitous cliffs. He gave a slide talk on Sunday night 13th March, and it looked as though a course in abseiling might be useful for those considering taking the trip.

Mr Paul Barnett on the same evening, gave a slide talk on Interesting Plants of the District and on the night of our arrival a young lady diver, Margaret O'Toole, showed pictures of Marine Natural History, many photos taken under water.

Also the Port Campbell National Park Ranger showed us a video of the district at the Park Information Office on Saturday morning.

A visit was made to Melba Gully, but the proposed barbeque and visit to the Glow Worms had to be cancelled because of the rain.

The glow worms are larvae of the Fungus Gnat and are carnivores, sometimes eating each other; they remain in the glow-worm phase with their brilliantly lit "fishing lines" for nine months of the year, then they enter a cocoon for nine days only before emerging as a free flying gnat that lives on an average for two days. It is thought that the black, carnivorous Otway Snail may feed on these glow worms.

A cliff-top walk beside Discovery Bay yielded some interesting coastal botany and at a beach close to where the "Falls of Halladale" ran aground and was wrecked, Bob Humphries of Stawell found a large echidna which was photographed by many.

On Sunday March 13th, after lunch, most of the party enjoyed a bush walk along the disused railway line between Glen Fyne and Curdies River. The last train on this line ran in 1986, after which the rails south of Camperdown were pulled up.

On the last morning, Labour Day March 14th, an early morning visit was paid to the home of Bonnie Cross, a Timboon Field Naturalist, who fed birds outside her kitchen window. Here we saw the eastern bristle bird and myriads of fire-tail finches, some blue wrens, scrub wrens, yellow robins and crimson rosellas, and an antechinus. We also saw the nest of the bristle bird in a clump of pampas grass.

Later, a walk was taken circumnavigating the swamps made by the demarcing back of the Gellibrand River by a sand bar at the mouth. These swamps are bad for the farmers, but make a prolific water bird sanctuary, with numerous black swans, herons, ibis, swamp hens and pelicans.

The mouth of the river keeps silting up and an effort to deflect the river water through a tunnel below Cape Ronald had been made in earlier times, but was ineffective.

An interesting dissection of an eel found on the ocean beach was made by Dr. Nairne Elder, and a dead penguin and a stormy petrel, both dead, were found.

After lunch and farewells, members returned to their home towns, vowing to return on the Labour Day Weekend in 1989 when the Geelong Field Naturalist Group will conduct the next Camp-out (meeting). Clubs who were unable to attend this year are advised to watch for advertisements for the Geelong meeting in 1989.

Elizabeth K. Turner, M.D.

VORG Conference

Victoria's Birds – Past, Present and Future

Over recent years it has been demonstrated that a great deal of valuable research can be undertaken by part time workers without the need to undertake time consuming treks into faraway places.

The Victorian Ornithological Research Group is holding a Conference at the Royal Children's Hospital over the weekend of 21-23 October 1988 to review the State of the present local research projects and to stimulate ideas for future projects. The Conference is open to anyone interested, and further information and registration forms are available from the VORG Conference Secretariat, PO Box 203, South Melbourne 3205. Numbers of registrants are limited and registrations will be accepted in order of application.

Speakers and topics planned at the time of going to press are:

Ian Rowley	KEYNOTE SPEAKER
Helen Aston	Galahs in Metropolitan Melbourne
Gordon Cameron	Birds of Barunah Plains 1920 to 1980
Mike Carter	Current techniques of sea-bird watching.
Kim Lowe	Banding studies in Victoria
Clive Minton	Waders – Victoria and further afield
Ellen McCulloch	BOCA's Birds and Garden Survey 1988
Allan McEvey	Historical ornithology in Victoria
David Paton	Honey Bees and competition
Mary Ellen Talmage	Putting the megabyte on megaburus: Microcomputers for ornithology.

Registration and an exhibiton of historical interest will take place on Friday evening and provide an opportunity to meet and chat to other registrants.

The Minister of Conservation Forests and Lands, The Hon. Joan Kirner, MLC has agreed to open the conference and it will conclude on Sunday afternoon with an excursion to Westgate Park, hosted by the Friends of the Maribyrnong Valley, to see the progress that can be achieved near a major metropolis.

Past VORG Conferences have acted as a stimulus for people to start new activities, and we hope that we will again be able to encourage some fresh approaches to the examination of the local species.

Gordon Cameron, Secretary, VORG.

INSTRUCTIONS TO AUTHORS

The Victorian Naturalist invites contributions of original papers relating to Australian natural history, particularly of Victoria. All papers are assessed by an independent referee before publication.

Short contributions of natural history observations are also invited for use as "Naturalist Notes". These contributions may be edited, or excerpts published, at the Editors' discretion. Such notes are not normally refereed, and may be submitted more informally.

All contributions are to be written in concise, simple English.

For cost reasons, authors of original papers submitted for publication are requested to conform with the following guidelines. Any author who has difficulty in complying with these guidelines, or has queries concerning manuscripts, should consult the Editors before submitting a manuscript.

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Manuscripts should be sent to The Editorial Committee, Victorian Naturalist, F.N.C.V., C/- The National Herbarium of Victoria, Birdwood Ave., South Yarra, 3141.

Two typewritten copies of the manuscript should be submitted. Authors are advised to retain a further copy.

Format

Text should be fully revised, typed double spaced on one side of the paper only, with a wide margin, pages numbered consecutively, and should conform in style to recent issues of the *Victorian Nat.*

Author's name and address or institution should appear beneath the title. Underline only those words to be italicised in the text i.e. genus and species names, and titles of periodicals and books. All measurements should be expressed in the metric system (SI units).

References should be cited in the text as Brown (1981) or (Brown, 1981). Footnotes must be avoided. Acknowledgements should be grouped at the end of the paper before References.

References should be listed alphabetically by author's surname at the end of the paper. All references should be cited in the text. Abbreviations of titles of periodicals should conform with those in *A World List of Scientific Periodicals* (4th ed., Butterworth). Refer to recent issues of the *Victorian Nat.* for the formatting of references.

Tables and Figures

Tables should only be used for essential data needed to show important points in the text. They should be numbered consecutively, referred to in order in the text, and designed to fit within the print area of 115 x 180 mm. Each table must have an explanatory caption.

Figures may be in the form of drawings or photographs. They should be identified on the back with the author's name and the figure number. The top should be indicated and the magnification by scale where appropriate. Compass directions must be indicated where necessary. All figures should be referred to in the text and numbered consecutively (Fig. 1, Fig. 2 etc.).

Figures should be carefully prepared and should be submitted ready for publication. Each should have a short caption. Maximum size is 115 x 180 mm; single column width is 55 mm. Figures are preferably submitted at actual size. Lettering on Figures should be done by the author; care is needed to ensure that all letters are legible after reduction.

Line drawings should be made in black ink.

Photographs should only be used where essential due to the high cost of printing plates. They should preferably be unmounted, glossy black & white prints, showing good detail and moderate contrast.

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Taxonomic Papers

Papers describing new taxa will not be accepted for publication unless the primary type material is deposited in a recognised public museum or herbarium.

It is suggested that in other more general papers where taxonomy is discussed, voucher material be lodged in a public collection, and the repository details cited in the text.

Special Note for Authors Using Wordprocessors

Many word processors and microcomputer floppy disks can now be transcribed directly to our printer's typesetting equipment, saving the effort and cost of rekeying.

Authors of papers which have been typed on a wordprocessor should tell the editor (at the time the paper is first submitted), what type of machine and wordprocessing software was used. Note that printed copy must still be submitted.

Queries can be directed to Russell Thomson, 17 Powlett Street, Heidelberg. 344 5713 (B.H.).

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In which is incorporated the Microscopical Society of Victoria

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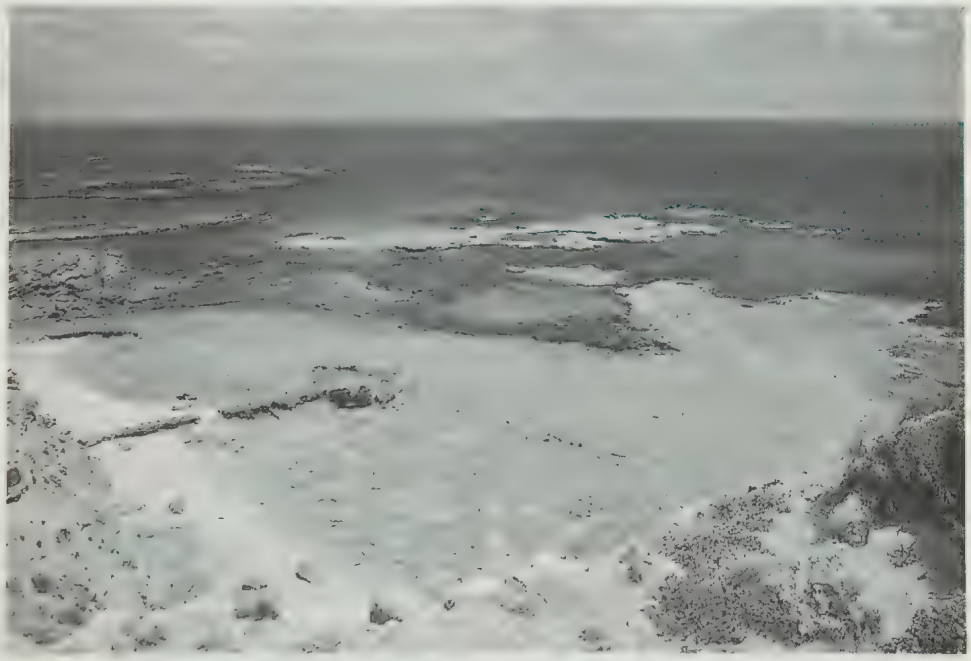
The Victorian Naturalist

ol. 105, No. 5 September/October 1988



Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

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FNCV DIARY OF COMING EVENTS

GENERAL MEETINGS (Second Monday)

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria Street, Melbourne at 8 p.m.

Monday, 10 October
Dr. Tom Rich "Dinosaurs in Victoria".

Monday, 14 November
Australian Natural History Medallion Presentation.

Monday, 12 December
Mary Doery "A Field Naturalist in Iceland".

New Members 21.7.88

Metropolitan:

Ms. Rosemary Atkins – Box Hill South
Mr. Neil Blake Clifton Hill
Dr. Peter Collier Balwyn
Mr. John Collier and Mrs. Nancy Collier
Mt. Waverley
Miss Sandra Day – Thornbury
Mr. Chris Dowd – Mulgrave
Dr. Pauline and Mr. Keith Schokman Doncaster
Mrs. Valerie Jago – Armadale
Mr. John McArthur and Ms. Merinda Epstein – Yarraville
Ms. Trish Thornton – Surrey Hills
Mr. Michael Vella – Mill Park
Mr. B. J. Waldron Balwyn
Mr. James Watson – Strathmore

Country
Mr. Alan McMahon – Erica

FNCV EXCURSIONS (First Sunday)

Sunday, 6 November. President's Picnic. Mooroodue Quarry. Graeme Love will meet us at the picnic ground (Melway 106 A1) in the Flora & Fauna Reserve at 11 a.m. This is a good area for geology, birds and botany. This trip will be by private and/or public transport. Members without transport, meet at Frankston railway station at 10.30 a.m., where cars will be waiting. (Train leaves Melbourne at 9.25 a.m. and arrives at Frankston at 10.27 a.m.) Bring a picnic lunch. If members have room in their cars for extra people, please contact Marie Allender or Graeme Love.

Saturday, 3 December. Healesville Sanctuary and probably Coranderrk Bushland. A bus leaves Lilydale railway station at 11.40 a.m., arriving 12.25 p.m. The return bus leaves the sanctuary at 5.05 p.m. Bring a picnic lunch. The plantlist for Coranderrk is being updated, and we may be able to add something to the list.

Thursday, 19 – Friday, 27 January. Kosiusko National Park & Canberra. For details see *Victorian Naturalist* July-August. Coach will leave from Flinders Street opposite Gas & Fuel at 9.30 a.m. Bring a picnic lunch.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Ave., South Yarra (150 metres nearer the Shrine than the Herbarium) at 8 p.m.

Botany Group – Second Thursday

Thursday, 13 October. "Orchids." George & Thelma Spice.

Thursday, 10th November. "Grasses." Suzanne L. Duigan.

Thursday, 8 December. Annual Meeting & Members' Night.

Geology Group – First Wednesday

Wednesday, 5 October. "Seismology in Australia." Gary Gibson.

Wednesday, 2 November. "Catastrophes, Extinctions & Evolution." Max Campbell.

Wednesday, 7 December. Members' Night.

Day Group – Third Thursday

Thursday, 20 October. Park Orchards. 100 Acres Flora & Fauna Reserve. 11 a.m. bus from Mitcham station (south side). (Catch 10.20 a.m. train from Flinders St.). Leader: Betty Gillespie 578 1879.

Thursday, 17 November. Lilydale & Lilydale Museum. For meeting place and train times, contact leader: Andy Blackburn 379 8960.

Microscopical Group – Third Wednesday

Wednesday, 19 October. Photography Through the Microscope. Microscope Life on Video.

Wednesday, 16 November. The Microscope: General Discussion, Questions & Answers. Display of Members' Exhibits Under the Microscope.

Fauna Survey Group – First Tuesday

Tuesday, 4 October.

Tuesday, 8 November.

Tuesday, 6 December. Members' Night.

Continued on inside back cover

The Victorian Naturalist

Volume 105, Number 5

September / October, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Photo: Bass Strait Coastline at Point Nepean (see page 116)

The Tubeworm *Galeolaria caespitosa* as an Indicator of Sea Level Rise

By Eric C. F. Bird*

Introduction

It has been suggested, on the basis of evidence from tide gauge records, that sea level has been rising 1.0 to 1.5 mm/year in recent decades (e.g. Barnett 1984), but there are contrasts in the trends deduced from particular tide gauges. When Pirazzoli (1986) examined the 229 tide gauges that have continuous records over a period of more than 30 years, he found that 162 (71.5%) showed a mean sea level rise of at least 0.1 mm/year, while 65 (28.5%) showed a fall in mean sea level. Only 30 (13%) showed the rise of 1.0 to 1.5 mm/year which had been suggested as a global average. Moreover, the 229 tide gauges are unevenly distributed around the world's coastline, 195 (85%) being in Western Europe and North America, and only 6 (2.6%) in the Southern Hemisphere (Fig. 1). The proportion of the world's coastline on which mean sea level has risen therefore remains uncertain.

In south-eastern Australia, Pirazzoli found only three tide gauges with continuous records spanning at least 30 years. These were Newcastle (1926-82), which showed a mean sea level rise of 2.0 mm/year, Sydney (Fort Denison) (1897-1983) a rise of 0.7 mm/year, and Port Adelaide (1882-1976), a rise of 2.5 mm/year. In Victoria the tide gauges at the entrance to Port Phillip Bay (Point Lonsdale) and at its northern end (Williamstown) have not been as consistently maintained as those in Sydney and Adelaide, but analyses of recent tide gauge records (1966-1983) has yielded no evidence of a sea level rise in Port Phillip Bay (G.W. Lennon, *pers. comm.*).

A world-wide sea level rise is expected to result from the "Greenhouse Effect", the global warming due to atmospheric accumulation of carbon dioxide and other gases generated by human activities. It has been predicted that this will cause an expansion of the oceans and partial melting of glaciers and ice sheets, leading to a sea level rise of about a metre over the next 60 to 100 years (Barth and Titus 1984).

Existing tide gauge records are not sufficient to determine present trends in sea level change on a global scale. Aware of this, the UNESCO Intergovernmental Oceanographic Commission has planned an improved Global Sea Level Observing System (GLOSS), with a much more even distribution of tide gauges, but sea level trends from these will not be available for some decades. In the meantime, studies of the physiographic changes likely to result from a rise in mean sea level have indicated that movements of zoned littoral organisms could provide evidence of sea level changes where information is not yet available from tide gauge records (Bird 1988a).

Intertidal Zonations

Marine organisms such as oysters, barnacles and mussels often occupy specific intertidal zones on cliffs, rocky shores, sea walls, and pier supports (Lewis 1964, Bennett and Pope 1953). If sea level rises these zones are likely to move upwards (Fig. 2). An example of such a response has been documented from the coast of south-eastern Florida by Wanless (1982), who showed that the upper limits of oysters and barnacles on concrete piling at Miami Beach rose by 15 centimetres between 1949 and 1981, equivalent to the sea level rise recorded on nearby tide gauges.

Such migrations, detected from historical surveys and dated photographs which show the levels of such zones in relation to fixed features, could provide evidence that a sea level rise is taking place. It would

*Department of Geography, University of Melbourne, Parkville, Victoria 3052.

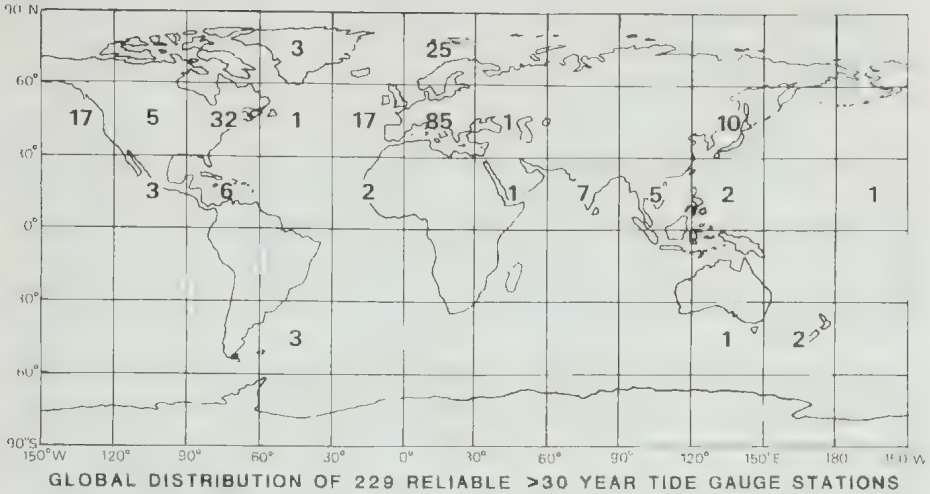

Figure 1. Global distribution of the 229 tide gauge stations with continuous records over more than 30 years. According to Pirazzoli (1986), 65 of these (28.5%) show a mean sea level rise of more than 2mm. year, 52 (22.5%) a rise of 1 to 2mm/year, and 47 (20.5%) a rise of less than 1mm/year. 65 (28.5%) show a mean sea level fall.

be useful to record existing levels of zones of marine organisms as a basis for future monitoring. The most suitable organisms are readily identifiable plants or animals that occupy particular parts of the intertidal zone with consistent, well-defined horizontal upper or lower boundaries that can be correlated with stages of the tide. Indicator organisms should be able to migrate upward as sea level rises by rapidly colonising adjacent levels that are untenanted, or occupied by other species that can be displaced or overrun.

Galeolaria caespitosa

In south-eastern Australia a preliminary investigation of marine zonations that could be used for such monitoring has focussed attention on the serpulid *Galeolaria caespitosa* (Lamarck), a polychaete worm that builds calcareous tubes, and forms colonies attached to rocky outcrops and artificial structures in the intertidal area, with an upper limit between mid tide and high neap tide level. This temperate zone species extends from Albany in Western Australia along the south coast to Cape Howe, and up the east coast past Sydney and Newcastle to Moreton Bay (Dakin 1952). It is found in Port Phillip Bay (King et al. 1971), and also in Tasmania (Guiler 1955). According to Hope Black (1971) it occurs "as a band at the top of the lower eulittoral", while Womersley (1981) described it as "a well-defined belt in the lower part of the mid eulittoral". In general the *Galeolaria* zone lies below the level occupied by barnacles and limpets, and above the level occupied by *Hormosira* (grapeweed), kelp and cunjevoi.

The worm tubes are initiated when a rock surface is colonised by *Galeolaria* larvae. Each of these builds a calcareous cylinder, the active growth of which is indicated by a small triangular white pointed lip at the mouth. *Galeolaria* forms entwined masses of hard white or pale grey tubes, usually at least 2 to 3 cm long, and 1 to 2 mm in diameter. When the calcareous tubes are submerged by the sea the worms protrude dark tentacles, which withdraw abruptly when touched. At low tide, when the tubes are exposed to the atmosphere, the worms retract behind a spiny operculum.

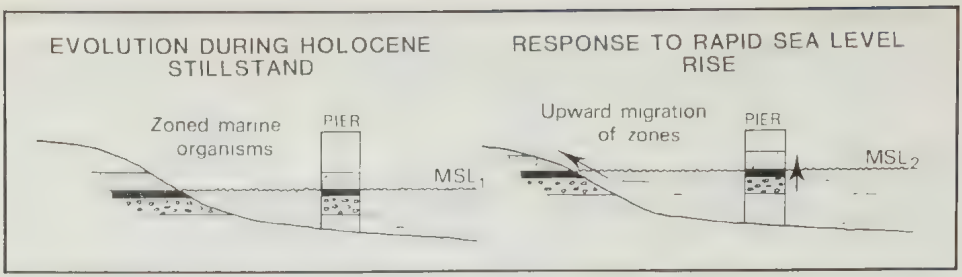

Figure 2. Response of zoned marine organisms to a sea level rise.

Galeolaria growth is best on sites sheltered from strong wave action and abrasive sand movement, where it forms either a thin coating or massive cauliflower-like encrustations of tubes cemented together. Its vertical range is typically about 30 to 50 centimetres, but there are variations in its luxuriance, and in the levels and distinctiveness of the upper and lower boundaries, related mainly to exposure to wave swash. On sites exposed to very strong wave action *Galeolaria* becomes sporadic, and usually gives place to seaweeds, but it can form a clearly-defined zone alongside rock clefts or on the inner sides of harbour walls, where the upper limit often appears remarkably horizontal.

The upper limit of the *Galeolaria* on rocky shores and artificial structures is generally about 20 centimetres above mid-tide level, rising on the more exposed sites and falling to lower levels in relatively sheltered areas, such as the inner sides of harbour walls (Fig. 3). Further investiga-

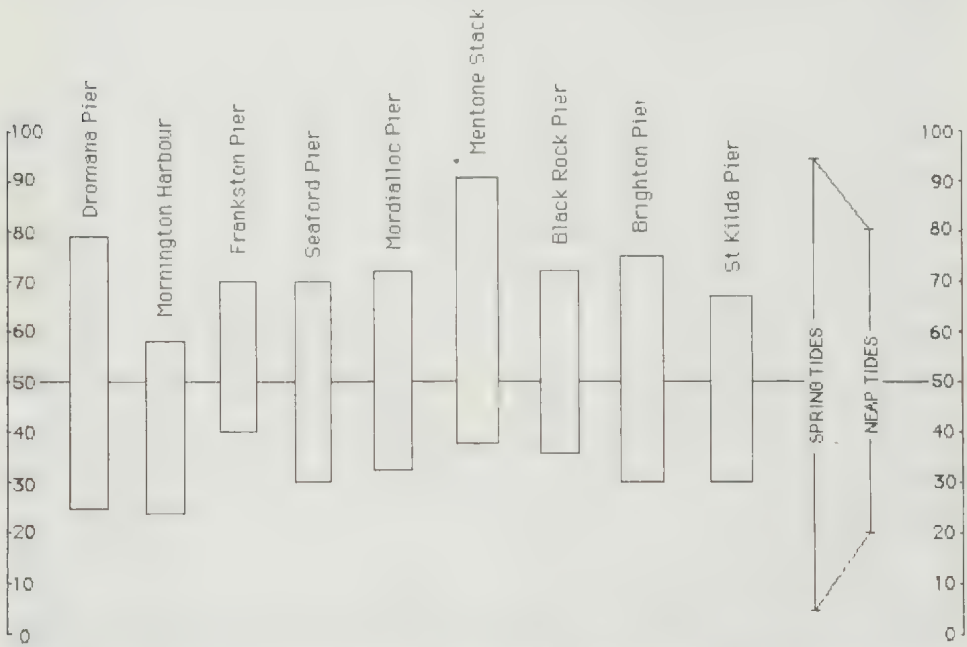

Figure 3. Levels (cm) of the *Galeolaria* zone at points along the east coast of Port Phillip Bay, measured during a spring tide in calm weather on 19th April 1988. The upper limit is higher on the more exposed sites (Mentone stack), and lower in more sheltered sites (Mornington Harbour).

Figure 4. The pier at Dromana, Port Phillip Bay, showing the 'cushions' of *Galeolaria caespitosa*, exposed at low spring tide on 22 March 1988. Measured on the nearest corners of the concrete supports, the top of the *Galeolaria* zone (thin arrows) stood 1.99 metres below the horizontal beam (thick arrows) on the double post A, and 1.90 metres, 1.89 metres, 1.86 metres, and 1.90 metres respectively on posts B, C, D and E. Photo: Eric Bird

tion is needed of the ecological factors that determine these upper limits, but it would appear that the tubeworms grow up to levels that are submerged, awash, or splashed during every high tide.

Sometimes the top of the *Galeolaria* zone appears horizontal from a distance, but on close inspection is found to vary by up to 10 centimetres. The upper boundary rises where wave uprush is strong, as along channels cut in shore platforms. Scattered individuals can live at higher levels on rock surfaces that are regularly splashed. The lower part of the *Galeolaria* zone is often partly overgrown by seaweeds, and disrupted by the growth of mussels. In transitions towards more sheltered sites *Galeolaria* becomes patchy, then sporadic and overrun or interspersed with barnacles, chitons, limpets and mussels (Burn and Bell 1976), before fading out altogether. It also disappears where the rock surface is abraded by the movement of sand and gravel agitated by wave action: *Galeolaria* has been killed, and the calcareous tubes worn and dissected, where abrasion has increased following the arrival of drifting beach sediment.

Galeolaria grows better on some rock types than on others. On the Victorian coast (Bird 1988b) it locally forms a well-defined zone on outcrops of basalt in the Western District, ferruginous sandstones around Port Phillip Bay, Cretaceous sandstones and mudstones of the Otway and South Gippsland coasts, and Palaeozoic shales and slates at Cape Liptrap and East Gippsland. Its growth is patchy on the granites of Cape Woolamai and Wilsons Promontory, and sparse on the Pleistocene dune calcarenites of Warrnambool and the Nepean coast, and the marly limestones of the Port Campbell district. It is also found on sea walls and breakwaters built of concrete, masonry or piling, as at Williamstown and Mornington, but only patchily on boulders. Zones of *Galeolaria* with well-defined, roughly horizontal upper limits are found on wooden or concrete posts supporting piers, and on the sides of many boat launching ramps. Cauliflower-like encrustations are well de-

Figure 5. Galeolaria zone fringing a shore platform at Beaumaris. Photo: Eric Bird

veloped on concrete pier supports at Dromana (Fig. 4), and at Brighton, Mordialloc and St. Kilda, and the sea baths at Geelong. There is a well-defined *Galeolaria* zone around the wrecked battleship *Cerberus* at Black Rock.

Factors that limit the establishment and growth of *Galeolaria* include turbidity, for it fades out where the water becomes muddy, as in the Tarwin estuary at Andersons Inlet, and in the upper reaches of Westernport Bay. It could also be killed by marine pollution. The proportion of tubes containing living worms varies from place to place. There are sites (e.g. on the southern side of the breakwater at Warrnambool, and on the little stone pier near the Port Fairy lighthouse) where the *Galeolaria* zone appears well developed, but there are few living worms at present. In these sites the calcareous tubes have been abraded and dissected by wave swash. Surveys are necessary to determine how quickly *Galeolaria* can recolonise sites occupied by derelict worm tubes.

Under natural conditions, cushions of *Galeolaria* presumably grow until they become unstable and break off. Port engineers have chipped away *Galeolaria* growth from pier supports from time to time to prevent damage to wooden poles, but it soon becomes re-established.

Galeolaria and a Rising Sea Level

If a sea level rise proceeds, the upper part of the *Galeolaria* zone is expected to spread to higher levels on rocky shores, sea walls, piers and breakwaters by the establishment of new colonies of worm tubes, while the lower part dies back, and is perhaps replaced by other species. Evidence that *Galeolaria* would respond rapidly to such a rise is provided by its colonisation of two groynes on the coast at Brighton, in Port Phillip Bay. On the New Street groyne, a structure completed in December 1986, there was patchy colonisation by *Galeolaria* in July 1987, and by November 1987 there was already an incipient *Galeolaria* zone, with an upper limit above mid-tide level. The Park Street groyne, completed early in 1982, showed a more advanced stage in *Galeolaria* zone development by December 1987. From these observations it is deduced that if sea level were to rise, upward migration of the *Galeolaria* zone would establish a new

upper limit within a few years, and would probably keep pace with a sea level rise of a metre over 60 to 100 years.

Changes in the levels of *Galeolaria* could be monitored for evidence of their response to a sea level rise, especially at sites where the upper limit is horizontal. On coasts where a sea level rise has already occurred there should be a higher proportion of young and living individuals (i.e. tubes from which the dark-headed worms protrude when submerged by high tide) in the upper part of the *Galeolaria* zone than at lower levels. In Port Phillip Bay (where there is little evidence of a sea level rise from tide gauge records) preliminary surveys have shown that the proportion of living tubes in existing *Galeolaria* colonies is similar throughout the vertical range. It would be interesting to know if *Galeolaria* zones close to tide gauges that have shown evidence of a mean sea level rise in recent decades, as at Newcastle, Sydney and Adelaide, have growth patterns that correlate with this submergence.

Sites are being sought on the Victorian coast where the upper level of *Galeolaria caespitosa* is sufficiently well-defined and horizontal for surveys to be carried out to record any changes in relation to an identifiable local datum. The sites will be recorded photographically, and re-surveyed from time to time to determine whether any changes have taken place. In Port Phillip Bay such changes should correlate with changes in mean sea level demonstrable from the Point Lonsdale, Geelong and Williamstown tide gauges, and if this is the case, changes observed at sites elsewhere on the Victorian coast can be taken as indicators of a rise in sea level on sectors where tide gauge records are not yet available.

While the *Galeolaria* zone is often found on steep to vertical rock faces (Fig. 5), there are places where it has spread across the lower parts of a shore platform. Such spreading is likely to become more widespread if sea level rises: a rise of a few centimetres would produce extensive reefs on the shore platforms between Quiet Corner and Ricketts Point, Beaumaris. A continuing sea level rise would result in the movement of the *Galeolaria* zone on to sites where its establishment is not inhibited by abrasion or competition, and eventually up cliffs (Fig. 6).

Such changes, monitored by repeated photography from selected viewpoints along the coast, would indicate whether a sea level rise was taking place, but precise measurements would be difficult, given the variations observed in the upper limit of *Galeolaria*. In particular, a rising sea level is likely to result in deepening of nearshore waters, and a consequent increase in the height of waves approaching the shore, which would augment to levels reached by

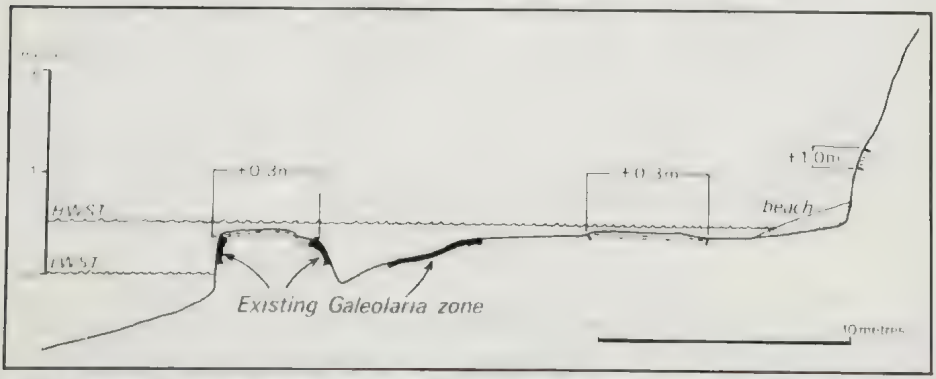

Figure 6. Expected changes in the position of the *Galeolaria* zone on a shore platform after a sea level rise of 0.3 metres, and after a sea level rise of 1.0 metres.
HWST = High water at spring tides, LWST = Low water at spring tides.

swash and splash. The response of *Galeolaria* to rising sea temperatures may eventually complicate the situation. Nevertheless, such measurements should be attempted, especially in the vicinity of recording tide gauges, to establish the relationship between changes in levels of *Galeolaria* and documented sea level trends.

Conclusion

Preliminary surveys on the coastline of Victoria have indicated that the zone of *Galeolaria caespitosa* often shows well-defined horizontal upper limits between mid-tide and high neap tide level. Sites are being selected for monitoring this upper limit for evidence of sea level changes, notably the sea level rise forecast as a consequence of the Greenhouse Effect. Rapid colonisation of newly emplaced rock surfaces and structures indicates that *Galeolaria* is likely to respond quickly to a sea level rise, and it therefore appears that monitoring of the upper part of the *Galeolaria* zone could provide an indication of such a rise. It remains to be seen whether the variability in the upper limits of *Galeolaria* will permit measurements as precise as those that can be obtained from tide gauges.

It is hoped that this paper will stimulate discussion of the possible use of marine zonations to monitor sea level changes, and encourage field naturalists to observe and measure the levels of the *Galeolaria* zone along the Victorian coastline.

Acknowledgements

This research forms part of a project supported by an Australian Research Grant, and has benefited from discussions with Dr. G. Parry (Victorian Institute of Marine Sciences), Dr. G. Watson (Department of Zoology, University of Melbourne), and Dr. J. Hope Black (National Museum of Victoria).

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Obituary: Margery J. Lester

Members of the Field Naturalists Club of Victoria were saddened to learn of the death of Margery J. Lester (Madge) on July 2, 1988.

Madge joined the Club in 1953 and was always an active member, attending excursions and meetings regularly. Her special interest was botany, and she served as secretary and president of the Botany Group at various times. As her knowledge increased she led excursions and spoke at meetings. Her talks were always carefully prepared and most informative, usually illustrated with a few well-chosen slides and beautifully-drawn diagrams, but she found speaking an ordeal and worried in case she was not good enough.

Although botany was her main interest she was interested in most aspects of natural history, with a good knowledge of birds, shells, mammals and insects, and she made a particular study of spiders. Madge liked to take her lunch and spend the day in the bush on her own, so that she could take her time studying and photographing without holding up other people on excursions. The results of her studies appeared from time to time in the *Victorian Naturalist*, in particular the series of photographs of a cicada which she took during one evening.

Madge was a member of the FNCV Council and the editorial committee. She was editor of the *Victorian Naturalist* in 1976-77, during which time she produced two special coast issues. She also edited the centenary issue (v.97 No. 3 May/June 1980), which commemorated the founding of the Club. As assistant librarian Madge undertook the arrangement of the library when it was relocated at the back of the Herbarium hall, and she spent many hours classifying and cataloguing the books, labelling shelves and generally making the library a vital part of the Club's resources. She was also Club reporter for a number of years.

Madge was a commercial artist, and used her talents to serve the Club in a variety of ways: signwriting, honorary membership certificates and posters. She was particularly helpful with Nature Shows, providing diagrams, illustrations, signs and general assistance with the planning, setting up and manning of displays. Many members will remember a poster she designed showing a kangaroo with a pouch full of wildflowers.

When Madge became ill towards the end of last year she gave to the Club her considerable collection of books on natural history, with instructions that some were to go into the library, but most were for sale to members, with the proceeds to go to the Kinglake fund. Over $400 was raised from the sale, and many members have expressed pleasure at not only possessing the books, but from the thought that Madge had owned and used them.

The Club has suffered a great loss with the passing of Madge Lester, but she has left many friends who appreciate the stimulus she gave to their lives, and happy memories of their association with her. Vale, Madge.

Marie Allender.

Roadside Vegetation: a Habitat for Mammals at Naringal, South-Western Victoria

By A. F. Bennett*

Introduction

In many regions of Australia where the natural vegetation has been extensively cleared for agriculture, remnants of native vegetation along roadsides are increasingly recognised as having an important role in nature conservation. Roadside vegetation may provide examples of indigenous vegetation which has largely disappeared from the region (e.g. Stuwe and Parsons, 1977; Yugovic *et al.*, 1985); it may include rare species of plants (Beauglehole, 1980 Appendix 5; Hussey, 1987); it may serve as a habitat or refuge for a wide range of faunal species (Way, 1977; Middleton, 1980; Krohn, 1981; Arnold *et al.*, 1987; Newbey and Newbey, 1987); and it has the potential to serve as a corridor for the dispersal of wildlife (Getz *et al.*, 1978; Breckwoldt, 1983).

At Naringal in south-western Victoria, clearing and fragmentation of the forests over the past 100 years has resulted in the loss of tree cover from 90% of the region. Presently, patches of forest of less than 100 ha in size, loosely linked by strips of forested vegetation along roadsides and creeks, provide the only remaining natural habitat for the native fauna. As part of a broader study of the biogeography and conservation of mammals within the fragmented forest environment at Naringal (Bennett, 1987a,b), an investigation was made of the potential role of roadside strips of vegetation as corridors to facilitate the dispersal of wildlife between otherwise-isolated populations in forest patches. Initially, a survey was carried out to determine the mammals present at a number of roadside sites varying in width, isolation and road usage. These results, supplemented with additional observations of mammals on roadsides, are presented here to illustrate the range of mammal species which utilise roadside vegetation in this locality.

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Study Area and Methods

Roadside vegetation at Naringal

Remnant forest vegetation occurs along many of the road reserves in the Naringal area as a narrow strip between the paved road surface and the adjoining fence-line, often forming an essentially continuous habitat, punctuated only by crossroads or gateways for farm access. Along narrow secondary roads, where the width of the road reserve is approximately 20 m, there may be only a single row of trees together with scattered shrubs and field vegetation totalling less than five metres in width. However, along wider road reserves (of up to 60 m total width), the belt of vegetation may extend to 40 m in width. Strips of forest vegetation are also frequently present along 'unmade' roads – road reserves approximately 20 m in width which have been surveyed and fenced, but which lack a developed road surface.

The roadside vegetation is chiefly low open-forest or open-forest dominated by *Eucalyptus obliqua* and *E. ovata*, the latter species being present in poorly-drained situations. *Acacia melanoxylon* and *E. viminalis* may also be present, particularly on volcanic soils in the north of the area. At roadsides where native vegetation remains dominant, the shrub stratum is usually well represented, and the field stratum is dense. In better-drained situations, the canopy is dominated by *E. obliqua*, and common plant species in the understorey include: *Acacia myrtifolia, A. stricta, A. verticillata, Banksia marginata, Gonocarpus tetragyna, Helichrysum*

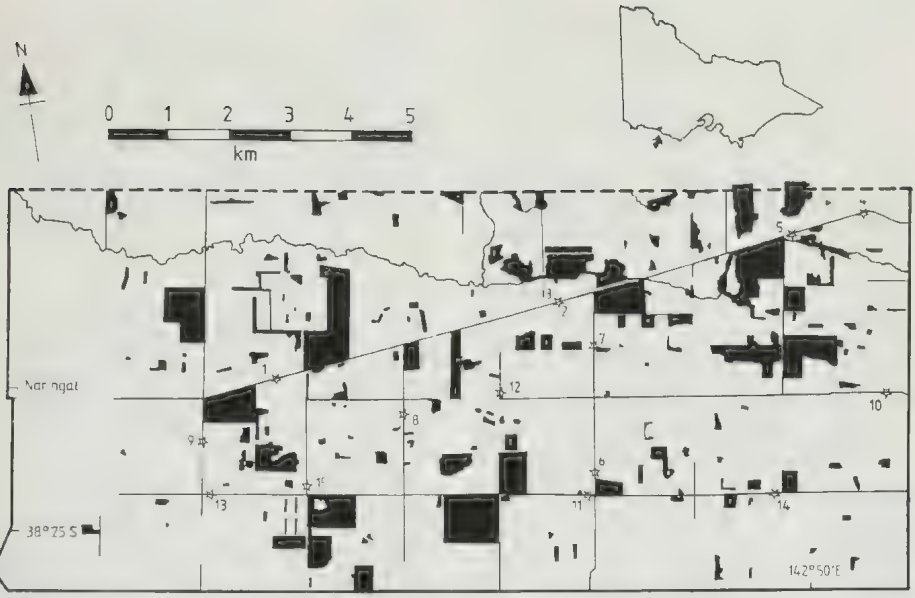

Fig. 1. Locations of roadside survey sites (★) in the Naringal study area. Forest patches are shown as shaded blocks, and lines indicate narrow strips of forest vegetation along road reserves and creeks.

dendroideum, Lomandra longifolia, Leptospermum juniperinum, Pteridium esculentum, Tetrarrhena juncea and *Tetratheca ciliata.* In wetter, poorly drained situations, *E. ovata* is the dominant canopy tree; and the understorey may include *Juncus* spp. *Lepidosperma laterale, L. juniperinum, Lepyrodia muelleri, Melaleuca squarrosa* and *Viola hederacea.* Introduced weeds and grasses are common along the roadsides, particularly at the edge of the forested strip. Prominent introduced plants include *Anthoxanthum odoratum, Holcus lanatus, Hypocheirus radicatus, Paspalum dilatatum, Sporobolus africanus,* and *Trifolium* spp.

Mammalian fauna using roadside vegetation

Observations of mammals using roadside vegetation at Naringal were from two sources, as described below.

(i) Survey of roadside sites.

Fifteen roadside sites were surveyed for the presence of mammals (Fig. 1). Severely disturbed vegetation dominated by introduced grasses and weeds was avoided; but otherwise, sites were selected to represent the range of road types present and a range of distances from the nearest forest patch. All sites had experienced past disturbance from tree felling or clearing of forest vegetation, and from deliberate burning. Most sites had a regenerating canopy with trees estimated to be less than 40 years old; and at two sites the vegetation was regenerating from an apparent loss of trees within the previous 10 years.

The width of the road reserve and the associated roadside vegetation and the straight-line distance to the nearest forest patch $\rangle$ 5 ha were measured for each site. An estimate of the volume of traffic was obtained from the Country Roads Board, Warrnambool (values for 1980), or estimated where data was unavailable.

At each site, a 150 m length of vegetation (on one side of the road) was intensively surveyed for the presence of mammals. Species were recorded if there

was any evidence indicating their present, or recent past, occurrence. Live-trapping was carried out (September-November, 1979), by using Elliott aluminium traps (32 x 9 x 9 cm) and wire-mesh cage traps (37 x 13 x 13, 37 x 18 x 15 or 43 x 20 x 20 cm), baited with a mixture of peanut butter, rolled oats and honey. Either three or four traps (one Elliott plus two or three cage-traps) were clustered at each of five positions 25-30 m apart, in order to 'saturate' the site with traps. A standard total of 60 trap-nights was recorded for each site. The identity, sex, and weight of each captured animal were noted before it was released at the point of capture. Nocturnal observations were made on two occasions at each site (approximately 0.2 hrs. on each occasion), by walking slowly along the road and searching the canopy and shrub strata with a 50-watt spotlight. Daylight searches were made for characteristic signs such as diggings, tracks, faecal remains or skeletal material. Ten hair-sampling tubes (Suckling, 1978), were positioned in trees at each roadside site, with the exception of two sites where only a few young regenerating trees were present. Hair samples obtained were identified following the methods of Brunner and Coman (1974).

(ii) Other observations

Incidental observations (1979-82) at other roadsides throughout the study area, and additional records from further trapping (1980-1982) at four of the survey sites, also contributed to a better understanding of the range of mammals and their frequency of occurrence in roadside vegetation.

Results

Characteristic features of each roadside survey site, including the width of the road reserve, the width of roadside vegetation, the canopy tree species and the distance to the nearest forest patch, are presented in Table 1.

Fourteen species of mammal were recorded in remnant forest vegetation at these roadside sites during the survey, and a further four species (Southern Brown Bandicoot, *Isoodon obesulus,* Koala, *Phascolarctos cinereus,* Common Brush-tail Possum, *Trichosurus vulpecula,* and Brown Hare, *Lepus capensis)* were recorded from other observations (Table 2). Thus, a total of 18 of the 23 species of mammal (excluding bats) known to presently occur in forest remnants within the Naringal area (Bennett, 1987a), also use

Table 1: Characteristics of survey sites on road reserves at Naringal. Canopy tree species: E. obl, *Eucalyptus obliqua;* E. ova, *Eucalyptus ovata;* E. vim, *Eucalyptus viminalis;* A. mel, *Acacia melanoxylon.*

Site	Road surface	Estimated volume of traffic (vehicles/day)	Total width of road reserve (m)	Width of roadside vegetation (m)	Distance to nearest forest patch (km)	Canopy tree species
1	Bitumen	600	59.9	39.9	0.33	E. obl, E. ova, A. mel
2	Bitumen	600	59.6	35.4	0.59	E. obl, A. mel
3	Bitumen	600	59.6	8.4	0.59	E. obl, E. vim, A. mel
4	Bitumen	600	59.4	30.3	1.07	E. obl, E. ova
5	Bitumen	600	59.1	32.3	0.11	E. vim, A. mel
6	Gravel	< 50	39.3	10.2	0.05	E. obl, E. ova
7	Gravel	< 50	35.5	11.3	0.50	E. obl, E. ova, E. vim
8	Bitumen	< 100	19.8	6.1	0.78	E. obl, E. ova
9	Bitumen	< 100	39.9	12.0	0.28	E. ova
10	Bitumen	< 100	32.9	11.6	0.98	E. obl, E. ova
11	None	0	19.8	19.8	0.05	E. obl, E. ova
12	Dirt track	0	19.8	15.8	0.67	E. obl
13	Gravel track	< 5	20.1	12.3	0.88	E. obl
14	None	0	20.1	20.1	0.08	E. ova
15	Dirt track	0	20.4	11.6	0.08	E. obl, E. ova

roadside vegetation in some way. Those species not recorded from roadside vegetation were the Feathertail Glider, *Acrobates pygmaeus,* Eastern Grey Kangaroo, *Macropus giganteus,* and Red-necked Wallaby, *Macropus rufogriseus,* and two aquatic species, the Platypus, *Ornithorhynchus anatinus* and Water-rat, *Hydromys chrysogaster.*

Mammals were present at all sites surveyed (Table 3). The most widespread species was the European Rabbit, *Oryctolagus cuniculus,* which was noted, either by observation or by the presence of characteristic diggings, at all of the roadsides surveyed. The number of rabbits observed was not recorded (Table 3) because of the abundance of this species along the ecotone between forested strip and adjacent pasture at the time of the survey. Two other introduced species, the House Mouse, *Mus musculus,* and Fox, *Vulpes vulpes,* were also widely recorded from the roadside vegetation. The House Mouse was trapped at 11 roadsides, while the Fox was observed at one site but recorded at six others by the presence of characteristic faecal scats (Table 3). Cats, *Felis catus,* presumed to be feral, were noted at three of the roadside survey sites, and individuals were frequently observed elsewhere on forested roadsides throughout the area. The Brown Hare was not recorded from forested roadsides, but this introduced species was sighted on grassy road verges on at least five occasions.

The most widespread and abundant native mammal was the Bush Rat, *Rattus fuscipes,* which was trapped on 227 occasions (25.2 captures per 100 trap-nights) from 14 of the 15 roadside sites (Table 3). The relatively high abundance (high trapping success) of this species may be attributed to the dense ground cover present at most sites. Most other native mammals were recorded from a small number of sites. The Swamp Rat, *Rattus lutreolus,* was trapped at three sites (Table 3) where there was a moist field stratum of grasses, sedges, and sedge-like plants (e.g. *Loman-*

Table 2: Mammalian fauna of the Naringal area, and those species recorded from roadside vegetation. (+) recorded at roadside survey sites; (O) recorded from roadside vegetation other than during the survey; (*) introduced species.

Species	Common name	Status in the Naringal area (1979-1982)	Occurrence in roadside vegetation
Tachyglossus aculeatus	Short-beaked Echidna	Common	+
Ornithorhynchus anatinus	Platypus	Uncommon	
Antechinus stuartii	Brown Antechinus	Common	+
Isoodon obesulus	Southern Brown Bandicoot	Uncommon	O
Perameles nasuta	Long-nosed Bandicoot	Uncommon	+
Phascolarctos cinereus	Koala	Rare (introduced)	O
Petaurus breviceps	Sugar Glider	Uncommon	+
Pseudocheirus peregrinus	Common Ringtail Possum	Common	+
Trichosurus vulpecula	Common Brushtail Possum	Uncommon	O
Acrobates pygmaeus	Feathertail Glider	Rare	
Potorous tridactylus	Long-nosed Potoroo	Common	+
Macropus giganteus	Eastern Grey Kangaroo	Uncommon	
Macropus rufogriseus	Red-necked Wallaby	Rare	
Wallabia bicolor	Swamp Wallaby	Common	+
Hydromys chrysogaster	Water-rat	Uncommon	
Mus musculus(*)	House Mouse	Common	+
Rattus fuscipes	Bush Rat	Abundant	+
Rattus lutreolus	Swamp Rat	Uncommon	+
Rattus rattus(*)	Black Rat	Uncommon	+
Lepus capensis(*)	Brown Hare	Uncommon	O
Oryctolagus cuniculus(*)	European Rabbit	Common	+
Vulpes vulpes(*)	Fox	Common	+
Felis catus(*)	Cat	Common	+

Table 3: Occurrence of mammals at roadside survey sites at Naringal.
Values represent the number of trap captures or sightings; (+) indicates occurrence based on characteristic diggings, tracks, scats or hair samples; (*) introduced species.

Species	Roadside sites															Total captures/ observations	Number of roadside sites
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Short-beaked Echidna		+									+	+				-	3
Brown Antechinus		1			+	3		+								4	4
Long-nosed Bandicoot										1						1	1
Sugar Glider						+										-	
Common Ringtail Possum		1					1	1		1	1					5	5
Long-nosed Potoroo		6				3					1			1		11	4
Swamp Wallaby											+			+		-	2
Unidentified macropod							+								+	-	2
House Mouse(*)	1		5	2			2	9	3	1	3	2	1		3	32	11
Bush Rat	24	36	3	10	36	14	6		24	11	12	2	11	26	12	227	14
Swamp Rat				8				23				8				39	3
Black Rat					4											4	1
Fox	+	+		1			+				+			+	+	1	7
Cat						+				1			2			3	3
Rabbit(*)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	15
Native mammal species	1	5	1	2	2	4	3	3	1	3	5	3	1	3	2		
Total mammal species	4	7	3	5	4	6	6	5	3	6	8	5	4	5	5		

dra longifolia, Lepidosperma laterale, Dianella tasmanica).

The Long-nosed Potoroo, *Potorous tridactylus,* was captured at four sites (Table 3), but probably also occurred at a further three sites where diggings and runways similar to those made by this species were noted. This species is locally common in forest remnants where there is a dense field stratum, which often comprises dense cover of *Lepidosperma laterale* in shallow depressions, with adjacent sclerophyllous vegetation *(P. esculentum, L. juniperinum, B. marginata, Acrotriche serrulata, Tetratheca ciliata,* and *Leucopogon australis)* on drier soils.

At three sites, the Short-beaked Echidna, *Tachyglossus aculeatus,* was recorded by the presence of characteristic diggings made when foraging for ants. Individuals were irregularly observed elsewhere on roadsides (on at least four occasions), foraging as they moved along the forested strip.

The most frequently observed arboreal mammal was the Common Ringtail Possum, *Pseudocheirus peregrinus,* with single animals observed at five sites (Table 3). This species is common in remnant patches of forest in the area. The Common Brushtail Possum was not observed at any of the survey sites, but individuals were recorded as road-kills at two locations close to farm houses.

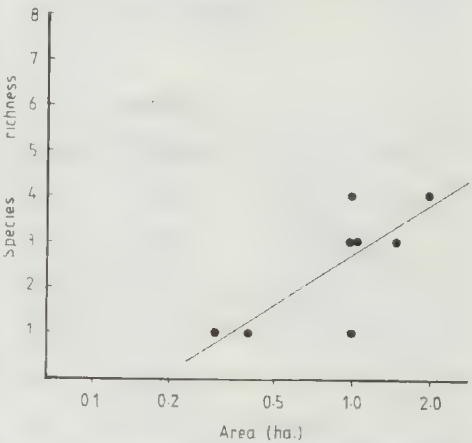

Fig. 2. Comparison of the relationship between mammal species richness and area for roadside sites (□) and remnant patches of forest (●) at Naringal. The regression line for the significant relationship between species richness of mammals and area of forest patches is:

TOTAL MAMMALS = 2.7 + 3.6 log AREA
(r^2 = 0.58, $p < 0.05$)

At two sites, both within 100 m of an adjacent forest patch, the occurrence of the Swamp Wallaby, *Wallabia bicolor,* was initially inferred from the presence of faecal pellets; and individuals were later seen at each site. Unidentified tracks of a macropod at two further sites may also have been from this species.

Hair-sampling tubes proved useful in recording the Brown Antechinus, *Antechinus stuartii,* from two sites where individuals had not been trapped, and the single record of the Sugar Glider, *Petaurus breviceps,* was also obtained from a hair sample. The occurrence of this latter species in roadside vegetation was further substantiated by two road-killed specimens and by later spotlight observation at another roadside.

In June 1981, a single Koala was observed on a narrow roadside verge of *E. ovata.* The origin of this animal is uncertain. This species was historically present in the area, but had not been sighted for at least 60 years. Later, in November 1981, a group of 10 Koalas was introduced to the Ralph Illidge Sanctuary, one of the larger remnants of forest in the study area, by the Fisheries and Wildlife Service (Warrnambool 'Standard', 4/11/1981).

The mean number of species recorded at each survey site was 5.1 (range 3-8), or for native mammals only, a mean of 2.6 (range 1-5). There was no simple explanation for the variation in species richness between roadside sites. There was no significant difference ($p > 0.05$, Kruskal-Wallis one-way analysis of variance) between mean values of species richness for sites grouped in relation to road type (main road, secondary road, or unused road), or isolation from the nearest forest patch (less than 0.1 km, 0.1 to 0.6 km, or more than 0.6 km), either for all mammals or for native mammals only. The relationship between species richness and area surveyed (150 m length by vegetation width) is shown in Fig. 2, together with that for small forest remnants of comparable size. In contrast to the significant correlations between species richness and area for forest patches (total mammals, $r = 0.76$; native mammals $r = 0.79$; $p > 0.05$ for both), species richness for roadside sites was not significantly correlated with area. The number of mammal species recorded from the roadside sites was higher than that for isolated patches of forest of comparable size (Fig. 2).

Discussion

Use of the narrow forested strips along roadsides at Naringal was not limited to a few common or generalist species, but included a wide range of mammals. At least 18 of the 23 species of mammals (excluding bats) which are known to occur in forested vegetation in the area were recorded from roadside vegetation. This total includes species which are uncommon within the area (e.g. Southern Brown Bandicoot, Long-nosed Bandicoot), as well as those which are abundant (e.g. European Rabbit, Bush Rat).

The occurrence of such a large proportion of the native mammalian fauna in roadside vegetation in this locality can be attributed to two main factors: the retention of native vegetation along road reserves, and the nearby presence of tracts of forest vegetation amongst the farmland (Fig. 1). Although relatively narrow, many of the strips of roadside vegetation have a well-developed understorey of shrubs and ground cover, which are necessary components of the habitat of most terrestrial mammals. Heavily disturbed sites, where the vegetation is dominated by introduced grasses and weeds, were not sampled; however, incidental observations and field experience suggest that few native mammals utilise such disturbed vegetation.

The close proximity of larger patches of forest and the continuity of many roadside strips with adjacent forest, provide a source of colonists to move into and through the roadside vegetation. In most instances, strips of roadside vegetation are part of a continuous habitat which may extend in a narrow belt for more than a

kilometre. These attributes contribute to greater numbers of species being recorded at roadside survey sites than from small discrete patches of forest of comparable size (Fig. 2).

Observations during this study suggest that mammals use the roadside vegetation at Naringal in a variety of ways. Roadside vegetation may provide some species with an additional area in which to forage (e.g. Short-beaked Echidna, Common Brushtail, Fox); it may serve as a refuge from disturbance (e.g. Swamp Wallaby, European Rabbit, Cat); and for some species it is a habitat in which they can live (e.g. Common Ringtail Possum, Long-nosed Potoroo, Bush Rat, Swamp Rat). Few species, however, are likely to maintain populations in such narrow strips of habitat in the absence of a nearby population in a forest patch. Evidence for the use of roadside vegetation as a corridor for the dispersal of mammals between other-wise isolated populations in forest remnants will be presented elsewhere.

The results from this study add to a growing body of evidence documenting both the value of roadside vegetation as a linear habitat (i.e. a narrow strip of habitat) for the conservation of wildlife, and the wide range of faunal species which are able to utilise this resource (Oetting and Cassell, 1971; Way, 1977; Middleton, 1980; Adams and Geis, 1983; Adams, 1984; Suckling, 1984; Arnold *et. al.*, 1987. Accordingly, the important role of roadside vegetation in the conservation of native fauna should be recognized in its management.

Roadside vegetation is of greatest value as a habitat for wildlife when the composition and structure of the vegetation are similar to those of plant communities occurring naturally in the locality. At Naringal, a natural forest understorey of shrubs and ground cover is necessary if the greatest diversity of forest wildlife is to be retained. Disturbance to this vegetation from grazing by stock, and from clearing, should be minimized so that the conservation value of these roadsides can be maintained and enhanced.

It is important that the continuity of roadside strips as a link between forest patches also be maintained and promoted. Single patches of forest in the Naringal area are too small for the long-term conservation of any but the most abundant species. Wildlife conservation in this area must be considered in a regional context in which remnant patches of forest and interconnecting strips of roadside vegetation are both integral components, together forming a network of natural habitat throughout the agricultural environment.

Acknowledgements

I am grateful to Dr. M. J. Littlejohn for supervision of this study and for comments on the manuscript. I also thank Ms. L. F. Lumsden for useful comments. Funds towards travelling costs were provided by the M. A. Ingram Trust and the Ian Potter Foundation. Animals were trapped under the provisions of permits from the Fisheries and Wildlife Service, Victoria.

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The Microscopical Slide Collection of the Late Paul Genery Donated To the F.N.C.V. by Mrs Peg Genery. July 1988

This lifetime collection of over 1000 slides by Paul Genery who was a member of the Microscopical Group of the Club containing many slides of historical as well as biological interest have been donated by his wife, Mrs. Peg Genery.

Among 110 slides of Rotifers mounted in flaid there are over 20 slides made by that famous mounter of rotifers, C. Rousselet. These slides were made in the years from 1895 to 1913, while other rotifer slides were made by J. Shepherd, an early member of the Microscopical Society of Victoria during the period 1900 to 1930.

Another group of slides were made by Mr B. Tindale of the Microscopical Society of Victoria. His special interest was Diatoms and there are 120 of his slides of strewn diatoms. An item of interest are nine slides of beautifully arranged sections of sea urchin spines.

An important part of the collection consists of the diatom slides made by Mr H Barrett who was a member of the Microscopical Society of Victoria, then later of the Microscopical Group of the F.N.C.V. Mr Barrett was a superb mounter of Diatoms and his life collection of 430 slides includes many splendid arranged groups. Apart from his skill in mounting diatoms Mr Barrett was known for his copper-plate hand writing and the text on his slides is a pleasure to read.

One more group of diatom slides is 88 slides of "Collection Peragallo Tempere et Peragallo" (2nd edition) apparently part of a large collection.

There are many other diatom slides of mixed origin contianing very good type slides, group slides, test slides and specimen slides, and also a variety of slides covering insects, botany and general subjects.

The gift of this collection of slides is an asset to the Club and the members of the Microscopical Group in particular appreciate this donation. Thanks Peg Genery.

D. E. McInnes

The Vertebrate Fauna of Point Nepean, Victoria I. Bat Fauna, with Notes on the Terrestrial Vertebrates

By G. W. Brown* and G. F. B. Horrocks*

Introduction

Point Nepean, the 'toe' of the Mornington Peninsula, is considered important for a number of reasons, not the least of which is that it provides an outstanding example of relatively undisturbed coastal habitat. Restricted access to Point Nepean, a condition of the early annexation by the Commonwealth Government for defence and quarantine purposes, has resulted in little interference and much of the area remains naturally vegetated.

The relatively large and undisturbed environment of Point Nepean makes it an important locality for studies of flora and fauna, especially since so few areas of this type now exist so close to Melbourne. Indeed, the uniqueness of this area is recognised in the recent (November 1985) agreement between the Commonwealth Government and the State Government of Victoria to incorporate it into the Victorian National Parks system.

Few detailed faunal studies have been undertaken in the Point Nepean area and these have tended to concentrate on the terrestrial mammal fauna and the avifauna (e.g. Callanan and Gibson 1977; Lane *et al.* 1984; Power *et al.* 1985; McLean 1986). The bat fauna, however, has been noticeably overlooked to the extent that, prior to this survey, no documented records for the Point Nepean area existed. The principal aim of this study, therefore, was to survey the micro-chiropterans of Point Nepean and monitor any seasonal changes in species composition. This work was part of a more intensive study of the total vertebrate fauna for Point Nepean. In the course of this survey, predator scats were collected for analysis and incidental observations of terrestrial vertebrates were also recorded and these are discussed below. Observations on the avifauna will be reported separately (Horrocks and Brown in prep.).

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Materials and Methods

Study Area

Point Nepean comprises a narrow western extension of the terminus of the Mornington Peninsula, which separates the Port Phillip and Western Port Bays, and is approximately 5 km in length and 3.5 km wide at its widest point. The study area covers approximately 590 ha above high water mark. The topography is low, undulating ground which has a maximum elevation of 54 metres a.s.l. at Cheviot Hill.

Point Nepean's Bass Strait coastline consists of a series of narrow beaches backed by precipitous limestone cliffs and capped by developing dunefields. This coastline is flanged by broad wave-cut rock platforms which generally increase in width westwards. In contrast, the Port Phillip Bay coastline is characterised by extensive sandy beaches, although rugged cliff-faces predominate towards the point.

Meteorological data for the Portsea Quarantine Station (Bureau of Meteorology 1975) show the study area to have a temperate climate with warm summers and cold winters, although there are no winter frosts. Mean daily temperatures reach a maximum in February (23.7 °C) and a minimum in July (7.0 °C). Rainfall is fairly uniform throughout the year, the summer months being the driest. Mean annual rainfall is 685 mm and the mean number of raindays per annum is 151.

The surface soils of the study area are extremely porous and consist of grey-brown loamy calcareous sand. These soils are highly alkaline and have accumulated relatively large amounts of organic material (Power *et al.* 1985).

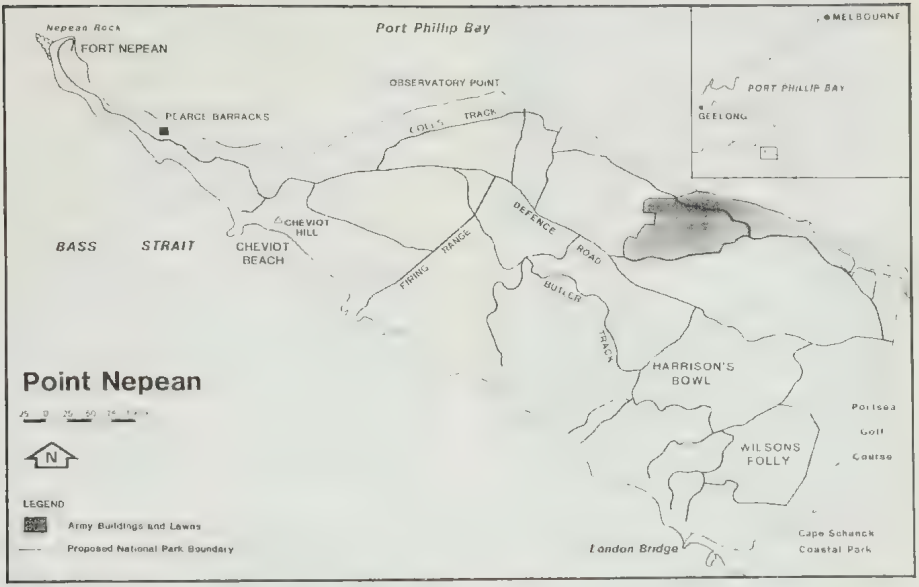

Fig. 1. Point Nepean study area, Victoria.

Point Nepean contains remnants of the original vegetation of the Mornington Peninsula. Indeed, it is one of few extensive areas of natural vegetation on the Port Phillip Bay foreshore. This vegetation has been mapped and classified by Parr-Smith and Smith (1978) and Power et al. (1985) who catalogued 174 species of vascular plants, 86 of which are introduced. Most of Point Nepean is covered by closed scrub (< 5 m tall) and low, open or closed forest (vegetation up to 10 m tall) which are dominated by Coast Tea-tree (*Leptospermum laevigatum*) and Moonah (*Melaleuca lanceolata*). Disturbed sites, consisting of grasslands of varied composition, freckle the study area, the most pronounced examples of which occur at Wilson's Folly and Harrison's Bowl. Disturbance since the mid-nineteenth century has resulted in the spread inland of Coast Tea-tree from its usual restricted habitat along the coastal dunes (McGregor and Johnstone 1987). The Bass Strait coastline, and to a lesser extent areas of the Port Phillip Bay shoreline, are characterised by vegetation directly affected by wind and salt. Hence, coastal scrub and heath, and those communities covering coastal cliffs and foredunes generally consist of low, hardy shrubs (e.g. stunted Coast Tea-tree, Boobialla (*Myoporum insulare*), Seaberry Saltbush (*Rhagodia baccata*)), herb and grass species.

Fires, which were probably frequent during aboriginal occupation, are now very rare in the study area. The Department of Defence has maintained fire records for the study area since 1954, which reveal that the most recent serious fire was in 1976 in the Wilson's Folly area (Power et al. 1985). At this site the tussock grassland, dominated by Tussock Grass (*Poa labillardieri*), has been regularly control-burnt to provide open grassland for military training purposes. Consequently, the establishment in Wilson's Folly of Coast Tea-tree, a fire-sensitive species, has been prevented (McGregor and Johnstone 1987).

The clearing of native vegetation for grazing was initiated about 1836 and

continued until 1854 (Power *et al.* 1985). Since then, the establishment of permanent holdings (i.e. settler's dwellings, quarantine station buildings, fortifications, fire-breaks, lawns and gardens) has necessitated the clearing of a significant proportion of Point Nepean. Fortuitously perhaps, these areas have been concentrated in the north-east of the study area where Norris Barracks now stands.

Field Techniques

Between July 1986 and September 1987 survey trips were made so that sampling was undertaken in every season. While a greater effort was made in Spring when there was an increased likelihood of capturing bats, the unavailability of suitable vehicles and inclement weather limited to one the number of trapnights in Winter.

Collapsible bat traps (modified from Tidemann and Woodside 1978) were set along potential flight paths on tracks, in clearings or at the entrances of tunnels associated with fortifications. Bat traps were set for 1-3 nights each trip at nine selected sites, although the limited numbers of traps available prevented the sampling of every site during each trip. Traps were erected at the following sites (Fig. 1):

1. Unnamed Track, running north of Defence Rd., due north of Cheviot Hill, in low closed forest dominated by Coast Tea-tree and Moonah with a relatively sparse understorey. (20 m a.s.l.).
2. Eastern end of Coles Track, adjacent to Observatory Point in the same type of low, closed forest found at Site 1. (10 m a.s.l.).
3. Harrison's Bowl Track, approximately 100 m north of the soak in Harrison's Bowl. Trap flanked by Coast Tea-tree but situated generally in grassland dominated by exotic grasses and shrubs usually less than 1 m tall. (40 m a.s.l.).
4. Unnamed Track, 100 m north of junction between Danson and Defence Rds., in open forest characterised by older Coast Tea-tree and Moonah which may attain heights up to 10 m. Relatively sparse shrub cover. (20 m a.s.l.).
5. Adjacent to Harrison's Bowl soak in very open grassland less than 1 m tall as a result of clearing and/or burning. Dominated by Tussock Grass. (40 m a.s.l.).
6. Harrison's Bowl Track, approximately 200 m south of Defence Rd., in scrub grassland dominated by Coast Tea-tree and Moonah. Very little understorey. (50 m a.s.l.).
7. Courtyard of Pearce Barracks. No immediate vegetation as the site was surrounded on most sides by dilapidated buildings. (20 m a.s.l.).
8. Entrance to tunnel complex beneath gun emplacement at Fort Nepean, ap-

Table 1. Seasonal and total composition of bats (N = 66) from the study site at Point Nepean. Number of bat trapnights is given in parentheses. M = Male, F = Female.

Species	Summer (9)		Autumn (10)		Winter (1)		Spring (23)		Total (43)	
	M	F	M	F	M	F	M	F	M	F
Chalinolobus gouldii (Gould's Wattled Bat)	1	–	1	–	–	–	2	–	4	–
Eptesicus regulus (King River Eptesicus)	–	–	1	1	–	–	2	–	3	1
E. vulturnus (Little Forest Eptesicus)	–	4	4	2	1	–	4+	12	9*	18
Nyctophilus geoffroyi (Lesser Long-eared Bat)	4	4+	4	3	–	–	8	7	16	14
Total	6	8	10	6	1	–	16	19	32*	33

* Does not include one specimen which escaped in Summer before its sex or age could be determined.
\+ Includes one juvenile

proximately 150 m from the Point. Amidst low, open coastal scrub dominated by Coast Tea-tree and Coast Beard-heath (*Leucopogon parviflorus*). (30 m a.s.l.).

9. Unnamed Track, approximately 50 m south of the rifle range in closed scrub. Trap flanked by Coast Tea-tree. (40 m a.s.l.).

Incidental data were also collected for terrestrial vertebrates in the study area. Diurnal observations of species or their signs, including characteristic scats, burrows, diggings and dreys were recorded.

Scats of predatory species, exclusively Fox (*Vulpes vulpes*) and Dog (*Canis familiaris*) were randomly collected during several field-trips. To determine prey species, hair extracted from these scats was identified using the technique described by Brunner and Coman (1974).

The scientific nomenclature for mammals follows Menkhorst (1987), and for reptiles and amphibians, Cogger (1986).

Results

Bats

Six survey trips between July 1986 and September 1987 inclusive yielded four species of bats representing one family, the Vespertilionidae. These were Gould's Wattled Bat (*Chalinolobus gouldii*), King River Eptesicus (*Eptesicus regulus*), Little Forest Eptesicus (*E. vulturnus*) and Lesser Long-eared Bat (*Nyctophilus geoffroyi*) (Table 1). *E. vulturnus* and *N. geoffroyi*

Table 2. Evidence for the presence of terrestrial vertebrate species recorded from Point Nepean, Victoria. O Observed, S Scat, SA Scat analysis, SK Skeleton, C Carcass, P Spoor, D Drey, B Burrow, H Heard

Species	Evidence
MAMMALIA	
Fam. Peramelidae	
Perameles nasuta (Long-nosed Bandicoot)	SA
Fam. Petauridae	
Pseudocheirus peregrinus (Common Ringtail Possum)	O, SA, D
Fam. Macropodidae	
Wallabia bicolor (Swamp Wallaby)	S, SK, P
Fam. Muridae	
Mus musculus(House Mouse)*	O, SA
Rattus lutreolus (Swamp Rat)	SA
R. rattus (Black Rat)*	SA, C
Fam. Canidae	
Canis familiaris(Dog)*	S, P, C
Vulpes vulpes (Fox)*	O, S
Fam. Leporidae	
Oryctolagus cuniculus(European Rabbit)*	S, SA, B
Fam. Otariidae	
Arctocephalus pusillus (Australian Fur-seal)	O
REPTILIA	
Fam. Agamidae	
Amphibolurus muricatus(Jacky Lizard)	O
Fam. Scincidae	
Lampropholis guichenoti (Garden Skink)	O
Leiolopisma entrecasteauxii (Grass Skink)	O
L. metallicum (Metallic Skink)	O
Egernia whitii (White's Skink)	O
Tiliqua scincoides (Eastern Blue-tongued Lizard)	O, C
Fam. Elapidae	
Austrelaps superbus Lowland Form (Lowland Copperhead)	O
Drysdalia coronoides (White-lipped Snake)	O
AMPHIBIA	
Fam. Myobatrachidae	
Limnodynastes dumerilii (Eastern Banjo Frog)	H

* Introduced species

Fig. 2. Open grassland at Wilson's Folly.

were by far the most commonly recorded species, constituting 42.4% and 45.4% of total captures respectively.

In total, 66 individuals (32 males, 33 females, 1 unrecorded) were captured over a total of 43 bat trapnights. Bats were captured at only four of the nine trapsites, viz. Sites 1, 4, 6 and 7. These yielded 7 (10.6%), 41 (62.1%), 17 (25.8%) and 1 (1.5%) individuals respectively. Total trapnights at each of these sites were as follows: Site 4 = 10, Site 7 = 7, Sites 1 and 6 = 6; all other sites < 5.

The only trapsites at which all four bat species were recorded were Sites 4 and 6. Two species, *E. vulturnus* and *N. geoffroyi*, were captured at Site 1 and only a solitary specimen of *N. geoffroyi* was trapped at Site 7.

Table 1 reveals that there was little seasonal difference in trap success. The mean number of bats captured per trapnight for each season was: Summer = 1.6 bats, Autumn = 1.6, Winter = 1.0, Spring = 1.5. The greatest number of bats was captured in Spring, although this appears to be a function of the greater effort (23 bat trapnights) put into trapping during this season. While the sex ratio per season for total bats varied little, the sex ratio per season for each species except *N. geoffroyi* differed noticeably, in most cases males outnumbering females. The most graphic instance of skewed sex ratios, however, is provided by *E. vulturnus* in Spring when females registered three times as many males.

Terrestrial Vertebrates

One amphibian species representing one family, eight reptile species (two families) and ten terrestrial or marine mammal species (seven families) were recorded through incidental observations and scat analysis (Table 2).

Some species, or evidence of their presence, were observed repeatedly, often during each trip e.g. European Rabbit (*Oryctolagus cuniculus*), *C. familiaris, V.*

Table 3. Absolute and percentage occurrence of mammal remains detected in predator scats, Point Nepean, Victoria.

Species	*Canis familiaris* (Dog)	*Vulpes vulpes* (Fox)	Unidentified	Total Number	%
Perameles nasuta (Long-nosed Bandicoot)	1	–	–	1	4.5
Pseudocheirus peregrinus (Common Ringtail Possum)	1	2	–	3	13.7
Mus musculus (House Mouse)	–	1	–	1	4.5
Rattus lutreolus (Swamp Rat)	2	–	–	2	9.1
*Rattus sp.**	4	3	–	7	31.8
Oryctolagus cuniculus (European Rabbit)	6	1	1	8	36.4
Total number of prey items	14	7	1	22	100.0
Total number of scats	14	8+	2+	24	

* All but one are likely to be *Rattus lutreolus*, the other *R.rattus* (dog scat).
\+ Includes one scat that did not contain any vertebrate prey items.

vulpes. Records for most species, however, consist of occasional sightings, generally single observations. For instance, Australian Fur-seal (*Arctocephalus pusillus*), White's Skink (*Egernia whitii*), Lowland Copperhead (*Austrelaps superbus* Lowland Form) and White-lipped Snake (*Drysdalia coronoides*) were only seen once. Other species were never observed directly, rather their presence within the study area was determined from secondary evidence. Swamp Wallaby (*Wallabia bicolor*), for example, was detected only through the presence of scats, spoor and skeletal remains.

Fig. 3. Extensive rock platform(s) (at lowtide) of the Bass Strait coastline.

Analysis of 24 predator scats collected over three survey trips identified 22 prey items representing at least five, probably six mammal species (Table 3). Some uncertainty exists because of the identification of *Rattus* hair; most hair identified was almost certain to be that of Swamp Rat (*R. lutreolus*), with the exception of one specimen, which was probably Black Rat (*R. rattus*) (B.E. Triggs pers. comm.). Two mammal species, Long-nosed Bandicoot (*Perameles nasuta*) and *R. lutreolus*, were only recorded by scat analysis.

The species with the highest percentage occurrence in predator scats were *Rattus* sp. and *O. cuniculus*, which together comprised at least 70% of total prey items identified.

Discussion

Records of 28 vertebrate species were collected during this survey, 72% of the total vertebrate species now known from Point Nepean (Appendix 1). These records include five new mammal species for the area, four bats and *P. nasuta* (Long-nosed Bandicoot).

When compared with the results of bat surveys from inland or high-altitude forested areas (Brown *et al.* 1987; Lunt *et al.* 1987) Point Nepean is relatively depauperate – only four species were captured and trapping success was low. However, comparison with other studies in Victorian coastal habitat (Lumsden and Schulz 1985) reveals a similar species diversity and trapping success.

All four bat species captured at Point Nepean during this survey belong to the family Vespertilionidae, the largest and most diverse of the six chiropteran families known to occur in Australia. Characteristically, these species are small in size and usually abundant within their range (Strahan 1983). All are widely distributed across south-eastern Australia, indeed *C. gouldii*, *E. vulturnus* and *N. geoffroyi* are widely distributed over the Australian continent. Like the majority of vespertilionids, the four species recorded during this survey are found in a variety of habitats, including most forest and woodland communities.

According to Hall (1981), most vespertilionids are relatively catholic in their choice of roost sites. The four species collected during this survey are known to utilize crevices, walls and small spaces in buildings, hollows and bark of trees and, with the exception of *E. regulus*, even the mud nests of the Fairy Martin (*Cecropis ariel*). The roosting habits of *N. geoffroyi* also include overhung cliffs and shallow caves (Hall 1981; Maddock 1983).

Point Nepean offers a variety of potential roosting sites, including buildings of the School of Army Health and derelict structures, both subterranean and aboveground, associated with the earlier

quarantine and fortification periods of occupation. Much of the study area is covered by a scrub complex characterised by the dominant species, *Leptospermum laevigatum* (Coast Tea-tree) and *Melaleuca lanceolata* (Moonah), the oldest trees of which attain a height of about 10 metres. The most successful Site, No. 4, was located in a relatively dense example of this formation, although the greater capture rate for this trap may have been an artifact of its position along a tunnel-like flight-path created by surrounding vegetation. In the study area *L. laevigatum* may provide suitable roosting sites because of its fissured stems with bark that flakes in long strips. However, more suitable roost sites might be available in isolated specimens of other, larger native and exotic trees, which also occur in the study area, predominantly in the north-east corner around the barracks and gardens. Messmate Stringy-bark (*Eucalyptus obliqua*) and Monterey Pine (*Pinus radiata*), for example, are large species (over 20 m in height) around which bats were often observed flying at dusk. The extensive sculptured cliff-faces that comprise the Bass Strait shoreline of the study area may also provide suitable sites for *N. geoffroyi* although no evidence, either visual or incidental, was found to confirm occupation of these cliffs by bats.

Seasonal difference in total trap success was negligible. This probably resulted, in part, from a deliberate effort to trap on nights when favourable conditions prevailed, as trapping success is determined by weather and moon phase; meteorological conditions such as low temperatures, high winds and increased lunar illumination seem to inhibit foraging activity in bats (Fenton 1969; Heithaus *et al.* 1974; Haeussler and Erkert 1978).

Except for *N. geoffroyi,* sex ratios for each of the bat species recorded during the survey differed between seasons. This is best exemplified by the large proportion of female *E. vulturnus* recorded in Spring, which is probably the result of movements from a nearby maternity colony since ten of the twelve individuals were captured over two successive nights in late November. This corresponds to the time that females congregate into maternity colonies and young are born (Richards 1983).

Several chiropteran species known from southern Victoria were not recorded from Point Nepean. Species such as Common Bent-wing Bat (*Miniopterus schreibersii*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) and White-striped Mastiff-bat (*Tadarida australis*) are all known from Victorian coastal environments, including the Mornington Peninsula (Andrew *et al.* 1982; unpubl. data, Atlas of Victorian Mammals). These are fast-flying species, however, and are usually difficult to trap due to their foraging strategy of hunting above the tree canopy and in open spaces.

Incidental records of 19 terrestrial vertebrate species, including ten mammal species, were obtained during the survey. Mammal species recorded include five introduced species (*Mus musculus, R. rattus, C. familiaris, V. vulpes, O. cuniculus*) which are all generally common and, with the exception of *R. rattus,* widespread over most of the State; most are well adapted to exist in a variety of habitats.

If trapping rate is used as an index of abundance then *M. musculus* is the most common mammal species in the study area – this species comprised 71.4% of total mammals captured by McLean (1986). Conversely, McLean trapped *R. rattus* least frequently (2.9%). Although the latter species reaches its greatest numbers in areas near human habitation it is commonly found in relatively unaltered coastal environments (Watts 1983).

Two large predator species, *C. familiaris* and *V. vulpes,* were identified during the survey, most commonly from spoor and scats. While it seems highly likely that *V. vulpes* resides within the study area, the status of *C. familiaris* in the area is not so clear. No dogs were observed and not enough evidence is available to ascertain whether feral or domesticated dogs are roaming the study area. Quite plausibly,

quasi-domesticated animals are utilizing Point Nepean as part of a larger territory. One other large predator, *Felis catus* (Cat), is known from the study area (McGregor and Johnstone 1987), although no record of its presence was collected during this survey.

Five native terrestrial mammal species were noted during the survey, which, with the exception of *Perameles nasuta,* confirm existing records. The Common Ringtail Possum (*Pseudocheirus peregrinus*) is known from a range of habitats, including well-developed coastal scrub, and is widely distributed across Victoria. It has been recorded from a wide variety of locations on the Mornington Peninsula (Callanan and Gibson 1977; unpubl. data, Atlas of Victorian Mammals). It is the only arboreal possum which constructs an external nest, or drey, although tree hollows are also utilized. During this survey many dreys, several of which were occupied, were observed in well-developed *L. lanigerum* about the middle of the study area, particularly along Butler Track.

Wallabia bicolor is a relatively common inhabitant of a range of forest and woodland communities in central and eastern Victoria, exemplified by the frequency of observations on the Mornington Peninsula, particularly around Clondrisse and Arthur's Seat (unpubl. data, Atlas of Victorian Mammals). According to McGregor and Johnstone (1987) it has been successfully reintroduced to the Point Nepean area and appears to be increasing in numbers. Although not seen during this survey many spoor and scats suggests that this species is relatively active and/or numerous.

Rattus lutreolus, the only native rodent known from the study area, occurs there in large numbers (McLean 1986; McGregor and Johnstone 1987). It is distributed widely across southern and coastal Victoria, and, characteristically, is dependent on dense cover and green vegetation (Watts and Aslin 1981). McLean (1986) found this species to be particularly abundant on the Port Phillip Bay side of Point Nepean in scrub complex dominated by *L. laevigatum* and Coast Beard-heath (*Leucopogon parviflorus*) and possessing a relatively dense undergrowth.

The only marine mammal recorded during the survey was Australian Fur-Seal (*Arctocephalus pusillus*) – one female was observed on Corsair Rock just off the tip of Point Nepean. This species is restricted to Bass Strait and the coastal waters of Tasmania, Victoria and southern New South Wales (Warneke 1983). One of the two largest breeding colonies occurs at Seal Rocks off the south-western tip of Phillip Island, approximately 50 km south-east of Point Nepean, and it is probably from this colony that the observed specimen originated. Individual *A. pusillus* are regularly observed inshore along much of the Victorian coastline at most times of the year, especially west of Seal Rocks (Warneke 1975, pers. comm.).

The most notable species recorded during the survey was *Perameles nasuta,* a solitary, nocturnal species notoriously difficult to trap. It occurs in Victoria in a diversity of habitats but is most commonly encountered in moderately-high rainfall areas of closed and open-forest. It had not previously been recorded from the Mornington Peninsula, although a young animal has recently been found dead just north of Green's Bush (approximately 22 km south-east of the study area) in open *Eucalyptus obliqua* – dominated forest with a heathy understorey (unpubl. data National Parks and Wildlife Division, Melbourne Fauna Survey).

During this study *P. nasuta* was detected through scat analysis, a technique which has previously revealed this species to be a regular but insubstantial constituent of the diets of *Vulpes* and *Canis* (Brunner et al. 1975; Friend 1978; Robertshaw and Harden 1985; Brunner and Wallis 1986). Only one specimen was detected, from a dog scat. It is possible that *P. nasuta* does not inhabit the study area and was consumed somewhere else on the peninsula.

Very little data on home range of feral or even quasi-domesticated dogs is available but work on *C. f. dingo* in New South Wales has shown that the average home range of adult animals was 2700 hectares (Robertshaw and Harden 1985). While it is spurious to compare the activity of subspecies in extremely contrasting environments, existing data highlight the relatively large areas that *Canis* can potentially cover.

Almost all of the reptile and amphibian species recorded during this study are generally widespread across much of Victoria and common where they occur (Brook 1982; unpubl. Museum of Victoria data). Only Metallic Skink *(Leiolopisma metallicum)* exhibits a relatively restricted distribution, being confined to south-central Victoria. With the one exception of Jacky Lizard *(Amphibolurus muricatus)*, all have previously been located prior to 1986 in the study area (Power *et al.* 1985).

Amphibolurus muricatus has only recently been recorded from Point Nepean, although it is known to inhabit coastal heathlands (Cogger 1986). McLean (1986) pitfall trapped several individuals in the coastal cliff community of closed heath overlooking Cheviot Beach. During our survey, several adults were observed basking in similar vegetation on the southern side of the study area, predominantly about the cliff-tops west of London Bridge.

The only amphibian species recorded during the survey, Eastern Banjo Frog (*Limnodynastes dumerilii*), was identified from vocalizations emitted from a soak at Harrison's Bowl. It is one of six amphibian species known from the study area, all of which are likely to be restricted to localized damp areas and soaks (Power *et al.* 1985). *L. dumerilii* is known to occupy a range of vegetation communities and relies on permanent and semi-permanent (summer-dry) swamps and ponds for breeding and oviposition sites (Littlejohn 1981).

Results from this and previous work on the vertebrates of Point Nepean reveal the area to have a rich vertebrate fauna. Our study recorded the majority of non-avian vertebrate species previously known from the area and an additional five species. Further detailed fauna research at this distinctive locale should reinforce its importance as a relatively undisturbed environment close to Melbourne.

Acknowledgements

We are especially indebted to the following individuals and organizations for their assistance in completing this project: Mrs B.E. Triggs for expert analysis of predator scats; Mr G. McGregor of the Department of Conservation, Forests and Lands for invaluable advice and logistical help; Major A. Haller and the staff of the School of Army Health for co-operation and assistance; Mr A. McLean and Ms S. Pratt for field assistance; Mr P. Menkhorst of the Department of Conservation, Forests and Lands, for advice and access to Victorian Mammal Atlas data; Mr A.J. Coventry, Curator of Reptiles, Museum of Victoria, for access to unpublished reptile distribution data; Mr M. Schulz of the National Parks and Wildlife Division, Department of Conservation, Forests and Lands for providing data from the Melbourne Fauna Survey; Mr J. Seebeck and Mr R. Warneke, both of the National Parks and Wildlife Division, Department of Conservation, Forests and Lands, and Mr H.E. Parnaby, School of Zoology, University of New South Wales, for reading early drafts of the manuscript and making helpful suggestions; Ms J. Firman for expertly typing the manuscript and Mr M. Batt for help with draughting.

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Australian Natural History Medallion 1988

The 1988 Medallionist is John Dell, a biologist at the Western Australian Museum. He was nominated by the Western Australian Naturalists' Club for his contribution to general natural history, particularly in herpetology and ornithology, and his involvement with conservation.

The Medallion will be presented at the Club's General meeting on Monday, 14 November, at the Royal Society's rooms, 9 Victoria Street, Melbourne. The meeting will be preceded by a buffet dinner starting at 6.30 p.m. and all members are invited to attend, cost approximately $12.50. Members wishing to attend should notify the Secretary, Ron Pearson, 23 Avenza Street, Mentone 3194 (584 7443)

Retirees for Conservation Project

We are a post-graduate research team currently undertaking a feasibility study to assess the possibility of forming a specialist volunteer conservation group made up of **retired** professional and technical people. We hope that, by negotiation, such a group might use research facilities at an established university. It is envisaged that the groups would consist of retired scientists, engineers, economists, journalists, administrators, etc. capable of undertaking high-level research on environmental issues. Essentially the new volunteer group would undertake projects which are, at present, outside the provisions of established resources.

A group such as this has the potential to broaden the scope of existing conservation organisations by virtue of their specialist knowledge and expertise, as well as providing stimulation and fulfilment to the participants. It would also make use of a valuable social resource. If the concept is successful, we could see it growing from its initial form or model into a national (or even international) movement, eventually capable of attracting major funding.

At this stage, we are approaching individuals and organisations who might be able to offer constructive comment and support on the notion as a whole. We would therefore be grateful for any comments or suggestions you may have in this regard.

Geoff Bellamy
Chairman, "Retirees for Conservation" Project Team
C/- Graduate School of Environmental Science
Monash University, Clayton, 3168.

Wanted Urgently

If you have a copy of the **Victorian Naturalist Vol. 103 No. 2** that you can donate to the club, you will help us very much as there are none of this number in the Club stock and orders for a series could be lost because of this missing issue.

Please bring to any meeting or post to:
D. E. McInnes,
129 Waverley Road,
East Malvern, 3145
(Postage will be refunded)

Field Naturalists Club of Victoria
Club Activities

The Club has been without a regular Club reporter for the past few months. The following is a resume of General meetings during this period.

General meeting 7 March, 1988.

The speaker was Mr Robert King of the Geological Survey of Victoria, whose topic was "Conservation of Geological Features in Victoria". Areas of geological interest fall into two categories: those which are significant at an international level and those at a national level. A committee consisting of representatives of the Geological Survey of Victoria, the Geological Society of Victoria, the National Trust and the Land Conservation Council selects the features considered worthy of preservation; about 1000 had been suggested over the past 15 years, of which about 200 had been chosen as having significance.

Exhibits: Green algae, *Euglena* from Altona beach; two forms of foraminifera, *Shepheardella* and *Bodella:* under microscopes. (Dan McInnes.) Trilobite in a rock from roadside gutter near FNCV Kinglake property (Chriss McInnes). Fox scats showing blackberry seeds (Sheila Houghton).

It was announced that the Club would be publishing later this year a Marine Diving Guide to Wilson's Promontory. Pat Carolan said that efforts are being made to preserve the reserve along the old Mornington railway, and Eric Quinlan would appreciate any information about the flora of the area. Tom Sault reported that a public meeting was to be held to consider further steps in the campaign to preserve more of Green's Bush.

General Meeting 11 April 1988.

The President announced the death in England of Mrs Hudson, wife of Dick Hudson, who was editor of the *Victorian Naturalist*, 1964-1966. Mrs Barbara Hadley gave a talk on her visit in 1985 to South Africa. She went on safari to South West Africa, and back to Johannesburg; flew to Capetown and returned overland. This was followed by an excursion to Swaziland and the Victoria Falls. Mrs Hadley illustrated her talk with slides taken during her journeyings.

Exhibits: *Actinosphaerium eichornii* and *Dictyosphaerium pulchellum* under microscopes (Dan McInnes). Three baby ring-tailed possums, which Wendy Clark had been caring for since she rescued them from the pouch of their mother who had been run over. Wendy was feeding them four times a day on a soy milk-honey mixture, using an eye-dropper, and chopped apple and rose petals.

Julian Grosovin reported that about 12 members of the Mammal Survey Group had attended a campout in the Mallee, at Ned's Corner, about 100 km west of Mildura. Tom Sault reported on another MSG campout near McKillops Bridge in E. Gippsland, attended by about 60 people, including the Hawthorn Juniors.

General meeting 9 May, 1988.

Graeme Love was elected President at the Annual General Meeting which preceded the General Meeting. In his opening remarks he thanked the Herbarium staff for their assistance in moving the FNCV library to its temporary premises. Two objectives to be considered by the Club in the ensuing months were the acquiring of our own premises, and the purchase of a word processor for work being done by Club officers.

The President announced the death of Alf Lewis, and Dan McInnes paid tribute to his work on behalf of the Club and the Hawthorn Juniors.

The retiring President, Dr Jack Douglas, gave a talk on some notable past members of the Club.

Exhibits: Three pieces of rock from Narre Warren showing types of fossilised leaves (Tom Sault). Sheila Houghton said that the continuing dry season had delayed the appearance of fungi at East Metcalfe, only two specimens being found: *Stropharia semi-globata* and *Mycena* sp.

Tom Sault proposed a vote of thanks to Dr Douglas, who, with little background knowledge of the Club, had come to its assistance by accepting the Presidency. The vote was carried by acclamation.

General meeting 6 June 1988.

Dr Jim Willis gave a talk entitled "A Naturalist among the British Isles". With the aid of his slides Dr Willis took us on a tour of gardens and parks of Britain, showing a variety of flora and fauna, native and exotic, going offshore to

the Isle of Wight, with a spectacular view of the Needles, St. Michael's Mount, the Scilly Isles, where he visited the sub-tropical gardens on Tresco, and went out to the lonely Bishop Rock Lighthouse, to the islands in the Bristol Channel, and to Anglesey.

Exhibits: Fungi formed the main exhibits, with a collection from the last Club outing to "Seawinds" on the Mornington Peninsula (Marie Allender), and some from Yarraville (Norm Plever). Dan McInnes had some microscopical exhibits.

The President announced that the Club was signatory to an advertisement in *The Age* 8 June 1988, seeking government funding for the Flora and Fauna Guarantee.

General meeting 11 July, 1988.

The President announced the death on 2 July of Madge Lester, and Marie Allender paid tribute to her work in many capacities in the Club, notably as Editor of the *Victorian Naturalist*, Club Reporter and Assistant Librarian.

John Bechervaise, who became an honorary member of the Club in December 1987, after 40 years membership, addressed the meeting on the topic "Life and Substance in High Latitudes". In his talk, which was illustrated by some excellent slides, John Bechervaise concentrated on the nature of the Antarctic continent, examining cause and effect. He emphasised the extreme dryness of the atmosphere, which mitigated to some extent the effects of the cold. The fact that the waters surrounding the continent are lower than the adjacent seas creates currents which draw nutrients from the sub-tropical waters, which sustain flora and fauna in Antarctica. Slides showed evidence of the destructive power of the fierce winds, and the sculptured effects produced by a combination of wind and ice movement which created vast areas of sastrugi. After numerous questions the President thanked John Bechervaise for his most interesting talk.

Exhibits: "The art of the diatom mounter" – a slide with 230 diatoms mounted in a regular pattern, the work of Mr H. Barrett, who was a member of the Microscopical Society of Victoria and later of the FNCV. A slide of the diatom *Melosira arenaria*, showing how the diatom grows in long filaments. Both these slides came from the collection of the late Paul Genery, which has recently been donated to the Club by Mrs Peg Genery. (Dan McInnes) A collection of fungi from East Metcalfe, including a number of cortinars, *Omphalina hypnorum*, and a large *Tricholoma sp.* found growing in a troop under *Exocarpus cupressiformis* (Sheila Houghton). A collection of geological specimens (Graeme Love).

WANTED

Club Reporter

The Club has been without a Club Reporter for nearly a year, which is a matter of great concern to Council.

As the *Victorian Naturalist* is the only contact which many members have with the Club, it is important that reports of meetings and information on Club affairs appear regularly. It is not an onerous job: all that is required is regular attendance at General Meetings and the writing of the report for publication. Ability to type, though desirable, is not necessary. General Meetings are held on the second Monday of the month, and for the remainder of this year will be held at the Royal Society, 9 Victoria Street, Melbourne. If you are able to assist the Club in this capacity, it would be a great service, and a rewarding undertaking.

Please contact the Secretary, Ron Pearson (584 7443) or any member of the Council.

Club News: Who's Doing What?

The President, Graeme Love, represented the Club at the launching by Barry Jones, Federal Minister for Science and Technology, of the **Victorian geology excursion guide;** edited by Ian Clark and Barry Cook, published by the Australian Academy of Science, 1988. (The library has a copy of this.)

Dr Jack Douglas organized the third International Organization of Palaeobotany Conference, Melbourne University Physics Department, August 24-27, 1988. There were pre-conference excursions to Tasmania and Central Victoria, and Dr Jim Willis was the keynote speaker at the opening. Graeme Love attended the conference.

Dr Stephen Henry has been appointed Resource Conservation Planning Officer SCI-3, Dept. of Conservation Forests and Lands, Orbost Region. We congratulate Stephen on his appointment, but regret the loss of our Conservation Co-ordinator and Council member. Graeme Gillespie has agreed to take on the conservation position, but we are still looking for two Council members, as there was already one vacancy.

Hilary Weatherhead lectured to the Castlemaine F.N.C. on fungi on July 8, and led an excursion to Firth Park, Wombat State Forest, next day.

Murray Haby has been appointed the Club's delegate to the Gould League of Victoria.

The C.C.V. report indicates support from field naturalists around the state for the Flora and Fauna Guarantee.

Stephanie Rennick and other Club members attended a rally in the City Square in July at which it was decided to make an all-out effort to acquire more land in the Green's Bush area. The appeal for funds is still open.

We would like to keep members in touch with what others in the Club are doing, whether in an official capacity or following their particular interet or field of study. Please let me have details – in writing, please! – so that we may keep this item going. (Address: 30 Golf Links Crescent, Dingley 3172.)

Sheila Houghton

Honorary Membership
Ian F. (Dick) Morrison – 40 Years in the FNCV

Elected to Club, Aug. 1948.

Active member of Botany Group, attending many excursions.

Dick's name appears in the Vic. Nat. as a contributor of accounts of excursions, and as the author of a variety of nature notes of his observations, but more frequently as a photographer.

In 1976, when the Editorial Committee was being re-organized, Brian Smith outlined plans for the future of the Vic. Nat., and announced that Dick and Alan Morrison had agreed to be the magazines "bank" for photographs, some of which the Committee planned to use for the covers.

Also Club members needing illustrations for articles could apply to Dick (and Alan). Dick Morrison being an authority on Victorian orchids, tonight (Mon. 8th Aug. 1988) we look forward to seeing some of his vast collection of slides.

POSTSCRIPT: We were not disappointed as Dick presented some 120 beautifully represented slides of Victorian orchids, and he also explained the basic parts of an orchid, and where to find them.

The 3rd IOP Conference 1988
(International Organisation of Palaeobotany)
– *Baragwanathia longifolia*

August 24th – 26th 1988

Hercus and Laby Theatres, Physics Building, Melbourne University.

The conference was attended by approximately 110 palaeobotanists representing some 25 countries. Australia was represented with registrants coming from all states except W.A. and N.T.

The FNCV (the only private body present) was represented by your President (Graeme Love), Im.Past Pres. (Dr. Jack Douglas – IOP Conf. Organiser), Mr. Norm Plever and Dr. Jim Willis (IOP Keynote Speaker).

Norm Plever was able to attend most of the excursions, and has already reported favourably about each of the excursions.

Approximately 100 papers were delivered with much discussion taking place during and after each session, and even during lunch. It seemed fossils were more appetizing than food.

There was adequate amount of data available in book and note form, also communication between languages and culture provided for many interesting conversation points. Two highlights were:

a. The Wednesday Night Dance
b. The 3rd IOP "Family" Photo.

Last but not least, the FNCV can feel justly proud that they were so well represented. Come on all you members, let us participate more often. The Club can only benefit; New Speakers, New Ideas, Update on past knowledge, and maybe even New Members.

Graeme Love – President

Continued from inside front cover

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursions.

Botany Group – Fourth Saturday

Saturday, 22 October. Flora Reserves & Railway Reserves. Remnant vegetation, Seymour area. Leader: Peter Carwardine.

Saturday, 26 November. Grasses. Leaders: David Albrecht & Neville Walsh.

Fauna Survey Group

Saturday, 29 October – Tuesday, 1 November. Inverleigh Common.

Saturday, 10 – Sunday 11 December. Water rats at Werribee.

HAWTHORN JUNIOR FIELD NATURALISTS CLUB

Meetings (7.30 p.m. at the Balwyn Primary School Hall, cnr. Balwyn & Whitehorse Rds., Balwyn.)

Friday, 7 October. Pond Life.
Friday, 28 October. Reptiles
Friday, 25 November. Desert Life.

Excursions

Sunday, 16 October. Willsmere Pond.
Saturday 3 – Sunday 4 December. Little Desert.

Biographical Index

I have started to compile a biographical index to members of the Club, old and new. At the moment the only source of information is the Author and Subject Indexes to the *Victorian Naturalist,* and in many cases the information is scattered about and difficult to track down. Work on the Club's archives and other records has revealed that we do have much more information about members, the offices they held in the Club and Groups, the fields of natural history in which they were active, and sometimes just the kind of people they were. If you have any information, either about your own activities (leading excursions, Group officer, giving talks, representing the Club, etc.), or have recollections of older members which you think would be relevant, I would be very pleased to hear from you.

Sheila Houghton,
Hon. Librarian

GRASSES OF VICTORIA in nature and horticulture
– a short CAE course by Graeme Lorimer, Andrew Paget and Ian Shimmen

The course will begin with background on the evolution of grasses and their importance in ecology, agriculture and horticulture. Their biology and identification will be taught with the aid of specimens and stereo microscopes. No prior botanical knowledge is required.

Horticultural aspects of Victorian species will be covered, including production of seed and nursery stock, and uses for lawns, gardens, parks and bushland revegetation.

Three 2-hour indoor sessions at the CAE in Flinders Street will be complemented by two half-day field trips (Gellibrand Hill Park and around the edge of the Dandenongs) to develop practical skills and understanding. Indoor sessions are Thursdays, 6-9 p.m., on Nov. 3, 10 & 17. Field trips begin 1 p.m. on Saturdays, Nov. 12 & 19.

The cost is $90 (or $58 concession), including notes. See your CAE course guide, or ring 652 0611 (quote course DG-1233).

Field Naturalists Club of Victoria

In which is incorporated the Microscopical Society of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron

His Excellency, The Rev Dr John Davis McCaughey, The Governor of Victoria.

Key Office-Bearers 1988-1989

President: Mr. GRAEME LOVE, P.O. Box 2018, St. Kilda West, 3182 (697 5109 B.H.)

Vice President: Mrs. SHEILA HOUGHTON, FNCV, National Herbarium, Birdwood Avenue, South Yarra, 3141 (551 2708)

Hon. Secretary: Mr. RON PEARSON, 23 Avenza St., Mentone, 3194 (584 7443)

Hon. Treasurer: Ms YVONNE GRAY, 46 Albany Cres., Surrey Hills, 3127 (890 1488 A.H.)

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Editor: Mr. R. THOMSON, FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141 (344 7743 B.H.)

Librarian: Mrs. SHEILA HOUGHTON, FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141 (551 2708 A.H.)

Excursion Secretary: Miss MARIE ALLENDER, 19 Hawthorn Avenue, Caulfield, 3161 (527 2749)

Club Reporter:

Conservation Co-ordinator: Dr. STEPHEN HENRY, c/- Arthur Rylah Institute, 123 Brown Street, Heidelberg, 3084 (450 8652 B.H.)

Sales Officer (Books): Mrs. H. STANFORD, 100 Middlesex Road, Surrey Hills, 3127 (830 1505)

Sales Officer (Victorian Naturalist only): Mr. D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Programme Secretary: Mr. GRAEME GILLESPIE, c/- Arthur Rylah Institute, 123 Brown Street, Heidelberg, 3084 (450 8652 B.H.)

Group Secretaries

Botany: Miss MARGARET POTTER, 1/249 Highfield Road, Burwood, 3125 (29 2779).

Day Group: Mr. D. E. McINNES, 129 Waverley Road, East Malvern, 3145 (211 2427)

Geology: Miss HELEN BARTOSZEWICZ, 16 Euroa Avenue, Nth. Sunshine, 3020 (311 5106 A.H.)

Mammal Survey: Mr. JULIAN GRUSOVIN, 17 Sutherland Street, Chadstone, 3148. (211 4997)

Microscopical: Mrs. ELSIE GRAHAM, 147 Broadway, Reservoir, 3073 (469 2509)

MEMBERSHIP

Membership of the F.N.C.V. is open to any person interested in natural history. The *Victorian Naturalist* is distributed free to all members, the club's reference and lending library is available and other activities are indicated in reports set out in the several preceding pages of this magazine.

Subscription rates for 1988

Metropolitan Members (03 area code)	$25.00
Joint Metropolitan Members	$27.00
Country/Interstate/Retired Members	$23.00
Joint Country/Interstate/Retired Members	$25.00
Student (full-time)	$18.00
Junior (under 18; no Victorian Naturalist)	$5.00
Subscription to Victorian Naturalist	$23.00
Overseas Subscription to Victorian Naturalist	$30.00
Affiliated Clubs	$25.00
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Individual Journals	$3.50
Late Fee (Renewing Members), after end of March	$2.00

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The Victorian Naturalist

Vol. 105, No. 6 November/December 1988

Published by the FIELD NATURALISTS CLUB OF VICTORIA

Registered by Australia Post. Publication No. V.B.P. 1268

$3·50

GENERAL MEETINGS (Second Monday)

Until further notice, General Meetings will be held at the Royal Society Hall, 9 Victoria St., Melbourne at 8.00 p.m.

Monday, 12 December.

Mary Doery "A Field Naturalist in Iceland".

Monday, 13 February.

New Members to 10.10.88

Metropolitan

Mr. John Dawes, Brighton.
Mr. Robert Van Dijk, Tullamarine.
Margaret Heron, East Kew.

Country

Mr. J.M. Matters, Seymour.

Joint Metropolitan

Mr. Joseph Wright Cade and Mrs Alina Danuta Cade, North Balwyn.
Robin Watson and Timothy Offor, Parkville.

FNVC EXCURSIONS (First Sunday)

Thursday, 19 – Friday, 27 January. Kosciusko National Park and Canberra. Coach will leave from Flinders Street opposite Gas & Fuel at 9.30 a.m. Bring a picnic lunch. We'll stay overnight at Corryong. Next morning we'll leave for Jindabyne, where we'll stay for 3 nights, with day trips into Kosciusko National Park. On 23rd we'll travel to Canberra, remaining there till Friday 27th. We'll stay there 4 nights, and there will be day trips to places of interest. Accommodation: dinner and breakfast in Canberra (other meals available). Cost: $520.

Sunday, 5 February. Sherbrook Forest. Leader: Hilary Weatherhead. Meet 10.30 a.m. at Belgrave station (train 9.23 a.m. from Flinders St., – check timetable). Bring a picnic lunch.

Saturday, 11 – Monday, 13 March. Victorian Field Naturalists Clubs Association annual get-together at Bellarine Peninsula. Hosted by Geelong Field Naturalists Club. Predominantly a coastal weekend with a variety of habitats – seashore, rock shelf, mangroves, freshwater lake, etc. A Marine Biology cruise in conjunction with Marine Studies Centre for those who would like it at about $15 extra. The cruise includes 5 hours on Port Phillip and Swan Bays, with a beach and rock shore walk and a Botany and bird life at Edwards Point, and discovering Ocean Grove Reserve. An optional snorkling with seals is a possibility. Other activities will be arranged for those wishing to stay on shore. Accommodation: Uniting Church Youth Camp at Ocean Grove. Meals, bed, mattress and pillow supplied. Other bedding will be required. Cost depends on number of people going on coach, but total cost should be about $130. Please book as soon as possible with Marie Allender. $40 deposit.

GROUP MEETINGS

Until further notice, Group meetings (other than Day Group) will be held at the Astronomers Residence, Birdwood Ave., South Yarra (150 metres nearer the Shrine than the Herbarium) at 8.00 p.m.

Botany Group – Second Thursday

Thursday, 8th December. Annual Meeting and Members' Night.

Thursday, 9th February. "Alpine Plants and their Habitats." Hilary Weatherhead with Andy Blackburn, Ilma Dunn and Ian Morrison.

Geology Group – First Wednesday

Wednesday, 7th December. Members' Night.

Wednesday, 1st February. Members' Night.

Day Group – Third Thursday

Thursday, 16th February. Black Rock to Ricketts Point. Meet at the corner of Bluff and Beach Rds., Black Rock at 11.30 a.m. (catch the 10.36 Sandringham train at Flinders St., then 11.15 a.m. Black Rock bus at Sandringham station. Leader: Dan McInnes 211 2427.

(No Day Group Meetings in December and January).

Microscopical Group – Third Wednesday

Wednesday, 18th January. Members' Night.

Wednesday, 15th February. Microscopes of all sorts and sizes.

Fauna Survey Group – First Tuesday

Tuesday, 6th December. Members' Night.

Tuesday, 7th February.

(Continued on page 149)

The Victorian Naturalist

Volume 105, Number 6

November / December, 1988
ISSN 0042-5184

Editor: R. Thomson.

Cover Photo: A Lace Monitor (*Varanus varius*) from East Gippsland. Photo: Brian Weavers, see p. 142)

The Mammals of Black Hill Bushland Reserve, Edgecombe, Victoria

By Ian D. Lunt*

Introduction

Black Hill Bushland Reserve occupies 48 ha at Edgecombe, 9 km north of Kyneton, Victoria (144° 29′ 20″ E, 37° 11′ 15″ S). The vegetation was described briefly by Lunt (1988) and a comprehensive plant list was given by Prictor (1987). DeLacy (1987) outlined the history of land use. This article presents the results of mammal surveys (excluding bats) in 1986 and 1987.

Methods

Five cage-traps (36 x 20 x 16 cm) and 54 aluminium Elliott traps (30 x 10 x 10 cm) were set on 28 and 29 October 1986, and 54 Elliott traps were set on 11 April 1987, giving 172 trap-nights over three nights. Traps were baited with peanut butter, honey and rolled oats and were checked daily. There were six nights of spotlighting, in January, February, April and October 1986 and April 1987, giving a total of 28 spotlight-hours. Spotlighting was conducted on foot. All incidental sightings were noted.

Results and discussion

Eight native and five introduced species were recorded (Table 1). Only three species were trapped: seven black rats and one echidna in October 1986 and five house mice in April 1987, giving a low capture rate of 0.08 captures per trap-night.

Holes and crevices beneath granite boulders provided shelter for all introduced mammals except the cat, which was wearing a collar and probably roamed from a nearby farm. Mammals were only caught near granite boulders.

The eastern grey kangaroo was the only native, terrestrial mammal that was relatively abundant. After intensive hunting early this century, kangaroos were not seen at Black Hill until the late 1960's (DeLacy 1987). Their numbers have since increased, and as many as 50 now regularly move between Black Hill and nearby bushland (I. DeLacy, pers. comm.). Only one swamp wallaby was observed. Koalas were released from Phillip Island in 1944 (DeLacy 1987).

The absence of small, native, terrestrial mammals may be due to many factors, including an open ground cover, historical

*15 Brookes Crescent, Macedon, Vic., 3440.

Table 1. Mammals recorded from Black Hill Bushland Reserve. Scientific and common names follow Menkhorst (1983), and asterisks denote introduced species.

Scientific name	Common name
Tachyglossus aculeatus	Short-beaked Echidna
Phascogale tapoatafa	Brush-tailed Phascogale
Trichosurus vulpecula	Common Brushtail Possum
Petaurus breviceps	Sugar Glider
Pseudocheirus peregrinus	Common Ringtail Possum
Macropus giganteus	Eastern Grey Kangaroo
Wallabia bicolor	Swamp Wallaby
Phascolarctos cinereus	Koala
* *Mus musculus*	House Mouse
* *Rattus rattus*	Black Rat
* *Vulpes vulpes*	Fox
* *Felis catus*	Cat
* *Oryctolagus cuniculus*	European Rabbit

Table 2. The number of mammals that were spotlit and the number of sightings per spotlight hour. Asterisks denote introduced species.

Species	Number of sightings	Sightings per spotlight-hour
Common Brushtail Possum	17	0.60
Koala	9	0.32
Sugar Glider	8	0.28
Common Ringtail Possum	6	0.21
Brush-tailed Phascogale	3	0.11
Eastern Grey Kangaroo	7	0.25
Swamp Wallaby	1	0.04
*European Rabbit	3	0.11
*Cat	1	0.04

Table 3. Trees in which aboreal species were recorded during spotlighting. Numbers in parentheses beneath *Eucalyptus* species indicate approximate percentages of each species within the reserve.

Species/Tree	E. obliqua (70)	E. viminalis (15)	E. melliodora (10)	E.rubida (5)	Acacia dealbata	Total
Common Brushtail Possum	7	2	5	1		15
Koala	1	4	1			6
Sugar Glider	2	5			1	8
Common Ringtail Possum	6					6
Brush-tailed Phascogale	3					3
Total	19	10	6	1	1	38

disturbances (timber and sand extraction in some areas), an absence of fire, and the abundance of foxes.

In contrast to the paucity of terrestrial, native mammals, all arboreal species except the brush-tailed phascogale were common (Table 2). They appeared to favour different species of eucalypts (Table 3); brushtail possums were commonly found in yellow box, even though there were relatively few of these trees in the reserve. By contrast, koalas and sugar gliders were recorded most frequently in manna gums, and ringtail possums were found only in messmate stringybarks: the most abundant eucalypt. The diversity of eucalypts (there are five species), may partly contribute to the abundance of arboreal mammals. Sugar gliders were much more common at Black Hill than in the wetter forests of the nearby Cobaw and Macedon Ranges (Boyce *et al.* 1981; Higginson 1985; Macedon Range Conservation Society, unpubl. data).

In spite of its small size and a history of utilization, Black Hill Bushland Reserve provides valuable habitat for arboreal wildlife, in a region that has been extensively cleared for agriculture. The presence of the brush-tailed phascogale, which was described by the Land Conservation Council Victoria (1985) as a "notable species" in the western Melbourne area, is of some significance. The long-term viability of the mammalian fauna of this isolated reserve may ultimately depend on the retention of roadside corridors which connect Black Hill with nearby bushland remnants.

Acknowledgements

Members of the Friends of Black Hill and the Macedon Range Conservation Society (MRCS), particularly Mr Barry Kemp, eagerly helped with spotlighting and trapping. MRCS purchased the spotlights and traps with grants from the M. A. Ingram Trust. Trapping was carried out under permit from the Fisheries and Wildlife Division of the Department of Conservation, Forests and Lands.

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Long-term Effects of Rabbit Reduction on Rabbit Island, Wilson's Promontory, Victoria

By F. I. Norman*

Introduction

Gillham (1960, 1961, 1962) provided descriptions of the flora and avifauna of several islands around Wilson's Promontory, Victoria, visited in 1959. At that time Rabbit Island had an extensive sand blow in the central region (Gillham 1961, 1962) and, though perhaps present years before (see Norman and Harris 1981 for some further details), by 1965 this eroded area occupied about 16 acres, some 20 per cent of the island's surface (Norman 1970). According to Gillham (1961, 1962) rabbits were affecting the island's flora and Norman (1967, 1970) summarised aspects of the island's vegetation and discussed changes immediately following the removal of rabbits. More recent changes were reviewed by Norman and Harris (1981).

In brief, rabbits were present in 1959 and up to January 1965, but only carcasses, scratchings and some fresh droppings were found in May 1965 (Gillham 1962, Norman 1967) and grazed plants were last recorded in August 1966, when a recent corpse was also found. Myxomatosis had apparently all but removed the population which was finally eliminated by a poisoning program ('one shot', '1080'; conducted from January 1966 to December 1967): none have been seen since 1965. By 1966 the eroded area had declined to 0.6ha, and had totally disappeared by 1979 (Norman and Harris 1981). The sand blow was initially colonised and stabilised by *Senecio lautus* and *Poa poiformis*, and prostrate species (mainly *Carpobrotus rossii* and *Kennedia prostrata*). In time the area became dominated by *P. poiformis* within which the shrubs *Acacia longifolia*, *Leptospermum laevigatum* and *Leucopogon parviflorus* gradually became more abundant. In this period the breeding colonies occupied by the short-tailed shearwater *Puffinus tenuirostris* expanded into the previously-eroded area and it was suggested that suitable soil depth limited their further distribution (Norman and Harris 1981). Fires have not been reported on the island since 1955 (see Norman 1967), nor is there any evidence of recent burning.

Rabbit Island has now been free of rabbits for over 20 years. This note presents further observations made there between 8 and 10 March 1988, and includes discussion of changes in the island's floristics in relation to studies elsewhere in Bass Strait.

Methods

In March 1988 the island was systematically traversed to identify major changes in vegetation cover, and to collect specimens of vascular plants previously unrecorded. During this visit a line transect (tape and compass) was also run along the route of previous surveys from the position of a previous (now absent) marker towards the trigonometric point at the summit. The cover (%) provided by each plant species was estimated for intervals of ten feet, shrub height noted and the presence of burrows of *Puffinus tenuirostris* also recorded.

Results

a) Flora

Apart from *Festuca* sp., occasionally present within the south-western *P. poiformis* tussock grassland, no new species were obtained in March 1988. Indeed annuals were generally absent and the dry seasonal conditions preceeding the visit mitigated against a complete listing of species previously recorded. As noted

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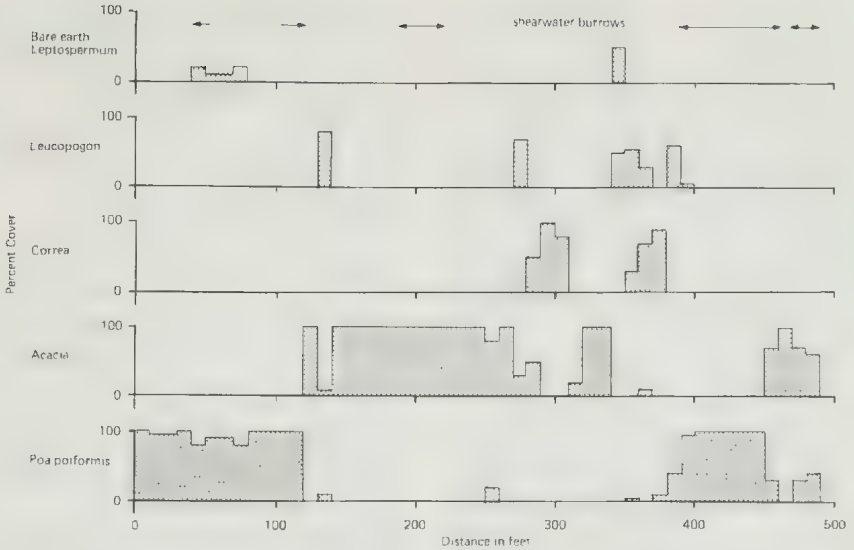

Figure 1. Line transect, 10′ units, showing estimated percentage cover provided by individual species: Rabit Island, 9 March 1988, across summit to trig. point at 75°.

in 1978-1979, there had been further, substantial changes in the structure of the supralittoral zone above the beach, and changes too in the vegetation of the area. No embryo dune system was present, *Cakile maritima* was absent (and was not found elsewhere on the island), and a stabilised, but undercut, secondary dune (which increased in height and extent from north to south) was dominated primarily by *Atriplex hastata* and *Rhagodia baccata (= candolleana).* Only a few, individual tussocks of *Ammophila arenaria* remained and the dune was backed by *Atriplex* which extended up the lower slope.

As in 1978-1979 the northern and southern ends of the island were dominated by dense, uniform communities of *P. poiformis* which formed a closed tussock grassland. No annuals were found and few other species were included. *Senecio lautus*, once a major element in some of the island's plant communities, was limited to few individuals (and then mostly dead); prostrate species (e.g. *Carpobrotus, Disphyma australe* and, very few, *Muehlenbeckia adpressa)* were restricted to coastal rocks, ledges or crevices. In somewhat more open areas occasional clumps of *Lomandra longifolia* and *Juncus pallidus* were present, as were *Scirpus nodosus* and *Festuca,* but *Bulbine* spp. were isolated on cliff faces. *Solanum* spp., most abundant above the beach, also occurred as individual plants (either dead, flowering or in fruit) within the homogenous grassland where infrequent, dead *Carduus tenuiflorus* were also present. The previously-persistent bracken *Pteridium esculentum* was less important generally in 1988 than on earlier visits and was restricted to the saddle above the beach.

Above the beach, and across the island towards the summit *Acacia* shrubs of various size (and age) have become well-established. This tall shrubland now includes individuals which reach 5-6m in height and 'over-mature' *Acacia,* perhaps wind-affected, have fallen, spreading branches which may extend the cover for over 10m. In the denser areas there is a deep litter layer, which had no associated under-storey or ground cover apart from a few isolated *Acaena anserinifolia.* More

open areas of the shrubland, apart from immature *Acacia*, included stands of larger *Leucopogon parviflorus, Correa alba* and *Poa poiformis* – with occasional *Scirpus nodosus*. Whilst few shearwater burrows were found under the mature *Acacia*, small breeding areas ($< 500m^2$) were present: within these the dominant species was *P. poiformis* which included *Juncus* and isolated, dead *Carduus*. Around the periphery of the shrubland *Rhagodia* was overgrowing lower *Acacia* branches in the more sheltered areas.

The trigonometric point was no longer visible from the position of the fixed peg used in previous transects across the eroded area (e.g. Figs. 3-7, Norman 1970; Fig. 2, Norman and Harris 1981). Indeed the tussock grassland present in 1978-1979 had generally disappeared whilst cover provided by more woody species had substantially increased. Results of the transect conducted in March 1988 (Fig. 1) show the current dominance of *Acacia* (43% compared with 0% in December 1967 and about 13% in 1979), *Correa* and *Leucopogon*, and the reduced cover (39%) provided by *P. poiformis*. (*Poa* had previously occupied some 41% of the transect in August 1966, 60.4% in December 1967, 70% in June 1968 and 74% in December 1979). In this region shearwater burrows, generally strongly associated with *Poa*, appeared to be limited in *Acacia* – dominated areas, perhaps both by the dense root mats and by the shrub branches. Species previously present along the transect route (particularly *Carpobrotus, Kennedia prostrata, Dichondra repens* and *Senecio* and *Carduus*) were absent in March 1988, whilst others previously unrecorded to 1968, namely the woody perennials *Correa, Leucopogon* and *Leptospermum*, were well-established.

The vegetation immediately above the beach has remained basically unchanged since 1979, with cover being provided primarily by *Atriplex* and *Rhagodia;* other areas are dominated by *Poa* which may include occasional *Juncus, Pteridium* or *Solanum*. Within this region of the island are the remnants of the sand blow, patches of bare soil within shearwater colonies and tracks used by little penguins *Eudyptula minor,* and dead *Carduus* are frequently isolated in small areas of sand. The eroded areas on the eastern side of Rabbit Island, present in 1978 (see Norman and Harris 1981), are no longer visible.

b) Birds

The breeding colonies of short-tailed shearwaters continue to represent the largest avian biomass present on the island, and by March 1988 they had extended into eroded areas present in 1978. Whilst 200-500 burrows of little penguins were perhaps present previously, this must now be a considerable underestimate since in March 1988 burrows were present behind the beach, around most of the coast and well within areas of the sand blow. (Indeed there may now be some 1-5000 penguin burrows on the island, T.L. Montague, *pers. comm.*)

In March 1988 large numbers of a corvid, perhaps *Corvus mellori* (up to 41), visited the island daily from the Promontory mainland and a migratory flock of the 'Tasmanian form' of silvereye *Zosterops lateralis* (20+) were also present, as were a pair of peregrine falcons *Falco peregrinus*. In the period January 1986 to March 1988, visits by T. L. Montague have only added the Flame Robin *Petroica phoenica* to the previous listing (Norman and Harris 1981). However, the breeding population of Cape Barren geese *Cereopsis novaehollandiae* has increased to 12 pairs (T. L. Montague, *pers. comm.*).

Discussion

In 1959 Gillham (1961, 1962) reported 24 vascular species of plants, including four aliens, from Rabbit Island. In 1965 the island's species total was increased to 37, with the additional species comprising 12 perennials (one alien) and one annual (alien). By September 1968 a further 11 (perhaps 12) had been recorded including

two aliens, both annuals, and visits in 1978 and, particularly, 1979 added another 14 species (eight perennials, six annuals) of which five were alien (four annual) species (Norman 1967, Norman and Harris 1981). Thus in the 20 years 1959-1979 there was an apparent increase of up to 39 species, i.e. almost two per year; of these nine were alien species, though few became widely distributed. Since Gillham's collections were made during drought conditions, some annuals may have been missed (though few such additions were reported in 1965) and the 1965 collection could be used as a base. If so, then 26 'new' species were recorded between 1965 and 1979, again an increase of almost two per year. However, Hope and Thomson (1971) collected on nearby Cliffy Island in 1967, some eight years after Gillham (1961), and found only three additional species there suggesting that her original listing for Rabbit Island may also have been near-complete, and that rabbits were indeed depressing species totals for the Island. Certainly, if mid-1966 represents the complete removal of rabbits from Rabbit Island, then the species list has increased substantially since that time. On Citadel Island too, to the west of the Promontory, where rabbits have disappeared since collections by Gillham in 1959 (Gillham 1961, 1962), there has also been an increase in species recorded (from 8 in 1959 to 25 in 1979) and cover generally had extended (Norman and Brown 1979).

Whilst the list of species recorded from Rabbit Island has increased, there have been some species apparently lost. For some (*Bulbine semibarbata, Cotula coronopifolia* or *Crassula sieberana*, not recorded since 1959, or *Tetragonia implexicoma, Crassula helmsii, Atriplex hastata* and *Solanum laciniatum*, not recorded in 1978-1979), this 'loss' may represent an identification or collection problem but others (e.g. *Vulpia bromoides, Spergularia media* and *Sambucus* sp., not seen since 1959; *Poa annua, Cotula australis, Dianella revoluta, Stellaria media, Cyathodes acerosa (= juniperinum), Lissanthe strigosa* or *Pultanea daphnoides*, not recorded in 1978-1979) seem to have not become established.

By 1979, 63 species (including 13 aliens) had been recorded from Rabbit Island, about one per 0.6 ha, compared with 41 (18 alien) from the 13.67 ha Cliffy Island (Hope and Thomson 1971), a ratio of 1:0.3 ha. Gillham (1961) ranked Promontory islands in order of apparent exposure, suggesting that species per unit area should decrease with increasing influence of spray-bearing winds. She considered that rabbits were suppressing specific representation on Rabbit Island, which had, in 1959, an anomalous, low ratio. Cliffy Island, by contrast, had a relatively high species: area ratio, one which was preferentially increased by alien species (Hope and Thomson 1971), and this still remains so despite variations in estimated area (cf. Gillham 1961 – 100 acres, Hope and Thomson 1971 – 35 acres).

The effect of rabbits on Rabbit Island, following fires, was obvious in 1959; removal of rabbits allowed increases in vegetative growth evident by 1966. Whilst the *Poa poiformis* grassland expanded rapidly, and was colonised by shearwaters, a tall shrubland dominated by *Acacia* is now established centrally. This community appears to have developed from a small 'patch' present at (or near) the summit in 1959, one which was then rabbit-grazed (Gillham 1961, 1962). Young and seedling *Acacia* were present by December 1967 and the, later, associated *Correa* and *Leptospermum* were present in 1965, but *Rhagodia* was first recorded in 1968. By 1988 this shrubland had developed to the extent that shearwater colonies had been restricted.

Norman (1967, 1970) suggested that Rabbit Island once had a central *Acacia*-dominated shrubland, with *Poa* tussock grassland around the coast. Evidence of old stumps, fire-charred, on the northern and western portions of the island supported this view. To an extent movement towards this climax has been followed

though to date the spread of the *Acacia* has been primarily in the saddle from just above the beach to the east side; however, a few individuals are present towards the south. Elsewhere on the Promontory islands shrublands may have also once been more extensive. On Wattle Island, for example, shrubs (mainly *Leptospermum*, but also *Correa, Albizia lophantha* and *Alyxia buxifolia*) extended along the island's spine, and occasional *Casuarina stricta* were found (Norman, Brown and Deerson 1980). Old stumps and branches present there indicated a more widespread distribution, as they did on Citadel Island where some *Leptospermum* had been cut down; however, on Citadel shrubs such as *Leptospermum* and *Correa* had increased between 1959 and 1979 (Norman and Brown 1979). Further into Bass Strait, Mullet and Murray-Smith (1967) considered that Dover Island, in the Kent Group, had been virtually untouched by humans: a coastal tussock belt exists at least in some parts of the island and it is backed by a shrubland dominated by dense *Leptospermum* and, ultimately, isolated 'groves' of *Casuarina stricta.* Scarlett, Hope and Calder (1974) noted that Long Island, in the Hogan Group, had an extensive shrubland whilst on Hogan Island itself such communities were restricted. They considered that the frequent burning and grazing (by cattle) on Hogan inhibited regeneration, and that the pattern of vegetation on Long Island – coastal tussock grassland and central shrubland – was similar to that previously proposed for Rabbit Island. Scarlett *et al.* (1974) considered, though, that tussock grassland species might form a ground layer in shrubland, and suggested that increased shrubland might not decrease the abundance of *P. poiformis* or associated species. On Rabbit Island, under the dense and mature *Acacia,* this decline of *Poa* has occurred.

In the 20 or so years since removal of rabbits from Rabbit Island, the breeding population of short-tailed shearwaters has increased – in area utilised at least, and in part too the apparent increase in penguin burrows must also be a consequence. However, few if any passerines yet inhabit the island regularly and most records are still of itinerant species or trans-Bass Strait migrants. Perhaps the most dramatic change to the island's avifauna has been the incidence of breeding by Cape Barren geese. The species, which was not present on the island in 1964 (Dorward 1967), or seen between 1965 and 1968, was breeding there in 1978-1979 (Norman and Harris 1981) and by 1987 about 12 pairs were nesting (T. L. Montague, *pers. comm.*). Whilst the geese are known to be limited by tussock for nesting (Dorward 1967), the expansion of range onto Rabbit Island may reflect a more general increase in numbers for it is now presumed to breed within Corner Inlet.

To an extent then the degeneration of Rabbit Island's vegetation has been halted, and regeneration towards a central shrubland bounded by a coastal tussock grassland begun. There have been some consequent changes in the island's avifauna and future development of a more extensive shrub flora may yet induce passerine establishment on the island.

Acknowledgements

I am grateful to Mr T.L. Montague (Zoology Dept., Monash University), for discussions on the island's avifauna; Dr. R. Parsons (Botany Dept., LaTrobe University) and Mr Montague also commented on a draft of this note, as did Mr R.M. Warneke (National Parks and Wildlife Division).

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Non-avian Vertebrate Species Known from Point Nepean

BY G. W. BROWN† AND G. F. B. HORROCKS†

This table accompanies the paper in the Victorian Naturalist Vol. 105 (5) pp 114.

CLASS MAMMALIA

Tachyglossus aculetus	Short-beaked Echidna
Sminthopsis leucopus	White-footed Dunnart
Isoodon obesulus	Southern Brown Bandicoot
Perameles nasuta	Long-nosed Bandicoot
Trichosurus vulpecula	Common Brushtail Possum
Pseudocheirus peregrinus	Common Ringtail Possum
Wallabia bicolour	Swamp Wallaby
Chalinolobus gouldii	Gould's Wattled Bat
Eptesicus regulus	King River Eptesicus
Eptesicus vulturnus	Little Forest Eptesicus
Nyctophilus geoffroyi	Lesser Long-eared Bat
*Mus musculus**	House Mouse
Rattus lutreolus	Swamp Rat
Rattus rattus	Black Rat
*Canis familiaris**	Dog
*Vulpes vulpes**	Fox
Felis catus	Cat
*Oryctolagus cuniculus**	European Rabbit
Arctocephalus pusillus	Australian Fur-Seal

CLASS REPTILIA

Amphibolurus muricatus	Jacky Lizard
Egernia coventryi	Eastern Mourning Skink
Egernia whitii	White's Skink
Lampropholis delicata	Delicate Skink
Lampropholis guichenoti	Garden Skink
Leiolopisma duperreyi	Three-lined Skink
Leiolopisma entrecasteauxii	Grass Skink
Leiolopisma metallica	Metallic Skink
Nannoscincus maccoyi	McCoy's Skink
Sphenomorphus tympanum Cool Temperate Form	Southern Water Skink
Tiliqua scincoides	Eastern Blue-tongued Lizard
Austrelaps superbus Lowland Form	Lowland Copperhead
Drysdalia coronoides	White-lipped Snake
Notechis scutatus	Mainland Tiger Snake

CLASS AMPHIBIA

Litoria ewingii	Brown Tree Frog
Litoria raniformis	Green and Golden Bell Frog
Geocrinia victoriana	Smooth Froglet
Limnodynastes dumerilii	Eastern Banjo Frog
Limnodynastes tasmaniensis	Spotted Grass Frog
Ranidella signifera	Common Eastern Froglet

* introduced species

[The records of *Parameles nasuta* from this region were made by the late Donald F. Thomson and will be reported in a paper by J. Dixon and L. Huxley which is to appear in a forthcoming issue of the Victorian Naturalist. Ed.]

Data were derived from the following sources:

Atlas of Victorian Mammals (unpublished data)

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Vital Statistics of the Lace Monitor Lizard (*Varanus varius*) in South-Eastern Australia

By Brian W. Weavers*

Fig. 1. A Lace Monitor (*V. varius*) from East Gippsland.

The lace monitor lizard (*Varanus varius*) (Fig. 1) is a very large carnivorous, predatory and scavenging lizard of the family Varanidae. This species is found in lowland and coastal forests of eastern Australia from Cape York to southern Victoria, and west to about Broken Hill and into south-eastern South Australia (Cogger, 1986). In this paper I present vital statistics of 101 individuals of *V. varius* that I have encountered in the field during the course of my studies on the thermoregulation of the species (Weavers, 1983). The data presented here are all from *V. varius* caught in the southeastern part of the species' range at Bendethera (35.958 S, 149.744 E) in the Deua National Park, NSW and in the Croajingolong National Park near Mallacoota (37.537 S, 148.685 E), Victoria. At these locations, *V. varius* is the only species of varanid (Cogger, 1986).

During my study, I weighed every *V. varius* immediately upon capture and also recorded snout-vent length (SVL) and total length (TL). SVL is the distance from the tip of an animal's nose to the anterior edge of its cloaca; TL is the distance from the tip of an animal's nose to the tip of its tail. SVL and TL of these struggling animals were considered accurate to within 10 mm. *V. varius* were weighed with Pesola spring balances so that experimental error was less than 2%.

The heaviest and longest free-ranging *V. varius* that I caught at Mallacoota weighed 14.0 kg (TL 1920 mm; SVL 750 mm) which establishes *V. varius* as the second largest terrestrial carnivore indigenous to mainland southeastern Australia. Only the dingo (*Canis familiaris dingo*) is heavier, with a maximum recorded weight of 19.4 kg (Newsome, 1983). *V. varius* is much heavier than the spotted-tailed quoll (*Dasyurus maculatus*) which weighs up to 7 kg (Edgar, 1983), the carpet snake (*Morelia spilotes*) which weighs up to 5.8 kg (Couper, pers. comm.), and the wedge-tailed eagle (*Aquila audax*) which weighs 4.3 kg (Morris, 1976). Its weight and length make *V. varius* the second largest species of lizard in Australia. The perentie (*Varanus giganteus*), which is not indigenous to southeastern Australia,

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Table 1. Weights and lengths of hatchling *Varanus varius* from southeastern Australia.

Source of specimens	n	Weight[a] (g)	Snout-vent length[a](SVL) (mm)	Total length[a](TL) (mm)	Mean ratio (SVL:TL)
Free-ranging parents: Deua National Park, NSW(35.96 S, 149.74 E)	4	21.6 (21-22)	129 (125-131)	324 (300-333)	0.40:1.00
Temora, NSW[b] (34.45 S, 147.53 E)	3	—	106 (105-107)	269 (265-273)	0.39:1.00
Termeil, NSW[c] (35.48 S, 150.33 E)	3	25.5 (25-26)	120 (118-121)	325 (321-333)	0.37:1.00
Mean		23	119	308	0.39:1.00
Captive parents:					
Bredl and Schwaner (1983)	4	34 (32-36)	119 (117-120)	305 (302-310)	0.39:1.00
Markwell (1983)	1	—	110	280	0.39:1.00

a. Mean (range). Standard deviations are omitted because of small sample size.
b. Eggs collected and hatched 6 9 days after collection by J.A.L. Watson, Division of Entomology, CSIRO.
c. Eggs collected by M. Lenz, Division of Entomology, CSIRO and hatched by author.

attains a similar TL although Butler (1970) has recorded a 17 kg perentie (TL 1930 mm) at Barrow Island, Western Australia. The maximum TL suggested in the literature for *V. varius* is about 2 m or 'more' (Worrell, 1963; Minton and Minton, 1973; Houston, 1978; Cogger, 1986), although these authors do not give a weight range. The largest *V. varius* previously reported in the literature weighed 10.4 kg (TL 1914 mm; SVL 765 mm) and was also caught in Victoria (Brattstrom, 1973).

At Bendethera the heaviest *V. varius* I found weighed 8.4 kg; the longest SVL I measured was 740 mm. Six *V. varius* from Mallacoota were heavier than any from Bendethera.

The smallest free-ranging *V. varius* that I encountered in the field was at Bendethera and it weighed 470 g (SVL 345 mm, TL 950 mm), although David Carter and I found four hatchlings in a termite mound in the Deua National Park (Table 1). These five animals were the only *V. varius* smaller than 800g that I have found in the field.

The mean size of 96 free-ranging *V. varius* larger than 800 g in weight that I encountered at Bendethera and Mallacoota was 4.4 (+ s.d.2.5) kg in weight, 603 (± s.d.96) mm from snout to vent and 1474 (± s.d.213) mm TL. Because the graphs in Fig. 1 are asymptotic, I suggest that *V. varius* in my sample approached the maximum sizes attainable by *V. varius* and that few were juveniles. The irregularity in the graph of TL and weights was caused partly because many adult *V. varius*, through injury, have lost part of their tails (which cannot regenerate). Although some *V. varius* have tails which are conspicuously shortened, others have lost only small sections and so it is not possible to reliably distinguish and exclude measurements from incomplete animals. The more regular curve of SVL and weight shows that SVL is a better indicator of animal size than TL. However, despite the inclusion of some adults with shortened tails, the mean ratio of SVL:TL for all adults in the present study (0.41 : 1.00) was not very different to the mean ratio for hatchings (0.39 : 1.00) (Table 1). Alternatively these ratios may be expressed as the tail length being about 1.4-1.6 times the SVL. This ratio is different to the ratios given by Cogger (1986) who describes the

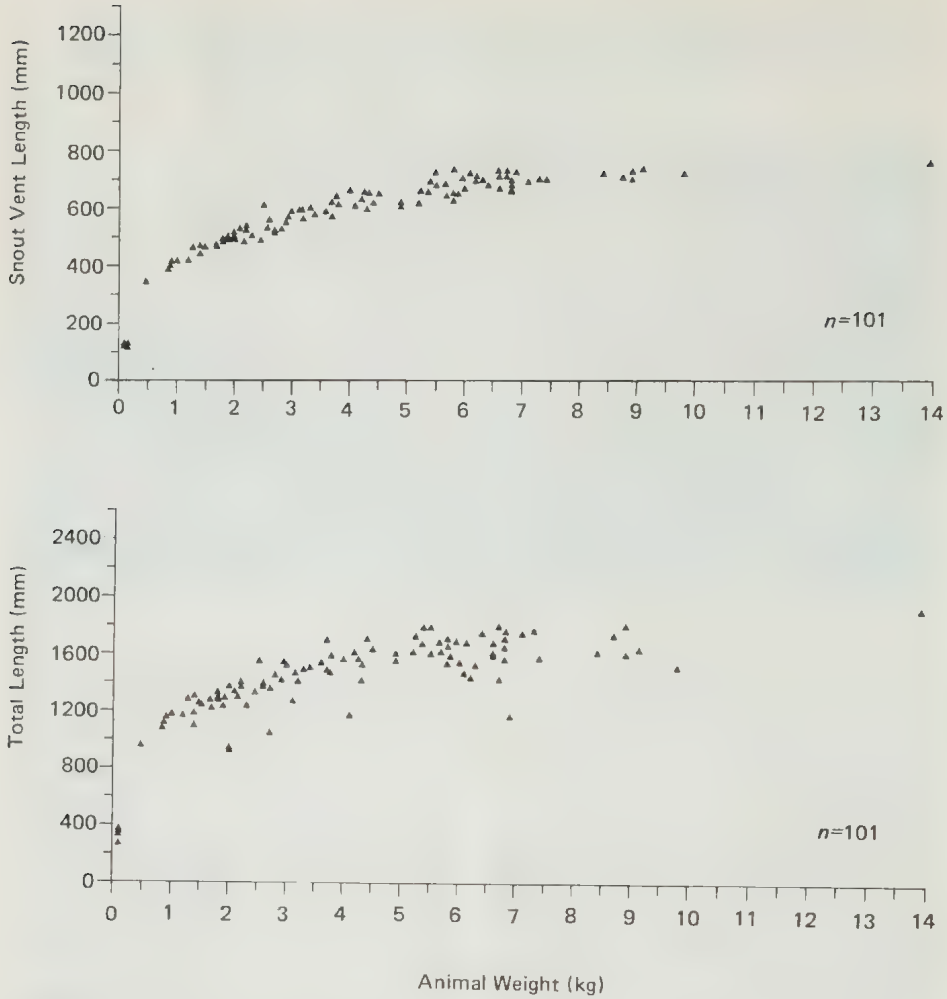

FIGURE 2

Upper. Snout vent length (SVL) and weight of *Varanus varius* from Bendethera and Mallacoota.

Lower. Total length (TL) and weight of *Varanus varius* from Bendethera and Mallacoota.

Each individual is represented only by the statistics recorded at initial capture.

tail being about 1.8 times the SVL and Houston (1978) who gives a ratio of 1.6-1.8.

At birth *V. varius* hatchlings from free-ranging parents are about 308 mm TL (SVL 119 mm) and weigh about 23 g (Table 1), although there is variation. The sample size before me, however, is too small to consider the possible causes of the variation. Hatchlings appear to grow rapidly, at least initially. I successfully hatched three *V. varius* eggs collected in February 1983 by M. Lenz (Division of Entomology, CSIRO) from a termite (*Coptotermes lacteus*) mound near Termeil, NSW. From the time of collection to hatching 8 months later, the eggs were kept at about 30° C in a portion of the original termite mound, enclosed in a polythene bag within an incubator. Fifty months after hatching and after having been fed mostly chopped mice

or whole fish once or twice per week during each Spring, Summer and Autumn, these three *V. varius* weighed between 850 g and 1375 g (mean TL 1078 mm; mean SVL 412 mm),

Free-ranging adult *V. varius* grew slowly. During my study I recaptured 18 marked free-ranging animals that were not being used for any experimental procedures; 5 of these animals were recaptured after 2 y or more. Only one animal showed any increase in SVL (from 665 mm to 695 mm during 51 months). However, weights of individual animals varied by as much as 23% (or up to 1.4 kg) during 2 months. The general lack of increases in length of *V. varius* over several years, together with the absence of apparent age classes in the weight-size measurements (Fig. 2), leads me to suggest that very large animals are probably much older than 20 years. The life span of *V. varius* is variously reported in the literature as 7 y (Goin and Goin, 1971), more than 15 y in captivity (Flower, 1937; Kennerson, 1979) and more than 20 y (Kennerson, 1979).

Acknowledgements

I thank David Carter (Australian National University, Canberra) for allowing me to include information on four hatchling *V. varius* that we collected together, Drs. M. Lenz and J.A.L. Watson (Division of Entomology, CSIRO, Canberra) for making eggs and hatchlings available to me, and Dr. Darwin Evans (Arthur Rylah Institute) for valuable comments on the manuscript. The manuscript was typed by Judy Firman, and the figures drafted by Martin Batt (both of the Arthur Rylah Institute).

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Ta-jerr and Tarrn-nin – Two Squirrel Brothers in Woiwurru Mythology

By N.H. Scarlett*

Introduction

Two recent papers by L.E. Conole and L.A. Hercus have considered the question of the arboreal 'Tuan' and its now much confused identity (Conole 1987; Hercus 1988).

The **Woiwurru** traditions presented and discussed below shed some light on this problem.

Bunjil's Boys

The Kulin tribes of central Victoria classified both people and natural phenomena into two divisions or moieties (see Berndt and Berndt 1964: 46). These moieties were named from two ancestral beings – **Bunjil** ("Eaglehawk": *Aquila audax*) and **Waang** ("Crow": *Corvus coronoides).* Among the Kulin these **moieties** were patrilineal, with children taking the moiety of their father (see Howitt 1904: 126 et. seqq.).

Two constant themes appear in the fragments of Kulin mythology recorded by the early European investigators:–

1. The ascent of **Bunjil**, his brother **Pal-ly-yan** and daughter **Karakarook** to the sky after an initial creative period (see Smyth 1876: 427; Howitt 1904: 127-128).

2. The later descent to earth of **Bunjil's** daughter and sons to intervene in the affairs of mankind (see Smyth 1876: 432, 427-428, 459-460). The sources differ as to the number of these sons, but a list of them was given to A.W. Howitt by **Berak** of the **Wurundjerri** clan (**Waang** moiety) of the **Woiwurru** tribe (Yarra, Plenty and Maribyrnong Rivers and their tributaries). **Berak** called them 'Bunjil's boys' (Howitt 1904: 128). Each of these mythic beings was represented by a star, as shown in Table 1.

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The legend of Koob-borr, Ta-jerr and Tarrn-nin

Smyth (1876: 446-449) published two versions of the myth of **Kur-bo-roo** or **Koob-borr** (Koala: *Phascolarctus cinereus*). In the second version "given by the men of the Upper Yarra", the sons of **"Pund'jel", Ta-jerr** and **Tarrn-nin** play an important role. Smyth does not record their identity, but Table 1 shows that according to Howitt, they are the Brush-tailed Phascogale and the Feathertail Glider, **Tadjeri** and **Turnung** in his transcription of the **Woiwurru** words.

The myth begins with the orphan **Koo-borr** taking all the **'tarnuks'** (wooden water vessels) of his adoptive tribe up into a small tree as a revenge for the tribe's ill-treatment of him. Then he fills the **tarnuks** with all the water of the creek running through the camp, at which point the tree miraculously grows to a great height, carrying **Koob-borr** and the **tarnuks** high into the air. When the tribe returns: "The blacks were very thirsty; the day had been hot; and they had not found any water in the places they had been." (Smyth 1876: 448).

Koob-borr refuses their appeals for water, and when two men try to climb the tree he laughs, lets some water fall on them – and (magically) they fall to their death. Two more men make the attempt with the same result until almost all the men of the tribe are killed. Men of other tribes also come, but two by two they are also killed in the same way.

"At length **Ta-jerr** and **Tarrn-nin** (the sons of PUND-JEL) came to the relief of the blacks. They proposed a plan of ascending the tree, which proved successful. They climbed round and round, just in the line which a creeping plant takes. **Koob-borr** laughed as he laughed at the

Table 1: Bunjil's Boys

Woiwurru Name	Star	Scientific Binomial according to Howitt (1904: 128)	English Term	Current Scientific Binomial
Tadjeri	Achernar	*Phascogale pennicillata*	Brush-tailed Phascogale	*Phascogale tapoatafa*
Turnung	?	*Petaurus pigmaeus*	Flying mouse	*Acrobates pygmaeus*
Yukope	α Crucis	*Zinchoglossus porphyriocephalus*	Green parroquet	*Glossopsitta porphyrocephala*
Dantun	β Crucis	*Trychoglossus multicolor*	Blue mountain parrot	*Trichoglossus haematodus*
Thara	α Centauri	?	Swamp hawk	*Circus aeruginosus*
Jurt-jurt	β Centauri	*Tinnunculus cenchroides*	Nankeen kestrel	*Falco cenchroides*

others, until they had ascended to a great height, and then he took water and let it fall, but the men were no longer in the same place, but higher up, and it did not fall on them. **Koob-borr** ran and got more water, and poured it where he had last seen the men, but again it did not touch them; and finally **Ta-jerr** and **Tarrn-nin** reached the high boughs. **Koob-borr** now began to cry, but they heeded not his cries. They seized him and beat him until all his bones were quite soft. They then threw him down, and other blacks beat and tried to kill him. He did not die. He became in form and appearance what he is now, and ran up another tree. **Ta-jerr** and **Tarrn-nin** cut down the big tree in which the **tarnuks** and all the water were; and the water came out of the tree, and flowed into the creek (**Kala-derra**). and there has been ever since plenty of water.

From this time **Koob-borr** became food for the people; but it is a law amongst the people that they must not break his bones when they kill him, neither take off his skin before they roast him. If the law were broken, **Koob-borr** would again become powerful, and he would dry up the waters of the creeks.

Koob-borr keeps always near the banks of the creeks, and near water-holes, so that if the law be broken he may at once carry away the water. No one has roasted **Koob-borr** without his skin or broken his bones in killing him since the law was made.

When anyone ascends a tree in which **Koob-borr** is sitting, he cries always in the same manner as he cried when **Ta-jerr** and **Tarrn-nin** climbed the tree and threw him down." (Smyth 1876: 448-449).

As recounted by Smyth, this myth has become a 'just-so' story and we can only guess at the religious philosophy and symbolism hidden in this 'outside' version – to use the Aboriginal English classification.

Discussion

What bearing does Howitt and Smyth's information have on the problem of the 'Tuan'? This depends on two related issues:-

1. Are Howitt's identifications of **Tadjeri** and **Turnung** correct?

Table 2. Vocabulary entries for **'Turnung'**

Aboriginal Term	Language	English Gloss	Source
Dar-naign	Wadjawurru, and Nyen.gurdenwurru ("Ballaarat")	Mouse	Thomas 1862: 153 (Sect.23).
Tur-nine	Djadjawurru (= Jaara)	Common Mouse	Parker (1878: 159).

Note: In Thomas (1862) the "Ballaarat" entries are in a language closely related to **Djabwurru** (see Dawson 1881). Parker (1884) calls this language **"Knenkoren-wurro"**.

Unfortunately, the writer has found no confirmatory evidence in any **Kulin** vocabularies. Hercus' record (1969) of the **Woiwurru** term **dadjer** (from Frank Wandin: Hercus 1988), gives us a correct transcription of **Tadjeri/Ta-jerr**; but as Hercus indicates (1988: 7), the animal involved was not identified with certainty. Bunce (1878) records the word **teed'thung** from the **Nyudhagala** (Lower Yarra **Woiwurru**), with the gloss 'Bat-mouse'; however this would indicate *Acrobates pygmaeus* rather than *Phascogale tapoatafa*. In any case **teed'thung** and **dadjer** may be quite unrelated words, despite the apparent similarity.

Turnung *is* recorded in vocabularies, but the English glosses are ambiguous, as is shown in Table 2. Thomas (1878: 124) also records **'Ty-ung'** with the gloss 'Rat (common)' but this may also be an unrelated word.

2. If we accept Howitt's identifications, what does this tell us about the identity of the **'Tuan'**?

(a) The equation **Turnung** = *Acrobates pygmaeus* cannot in itself confirm or deny Conole's equation **Tu-an-tu-an** (Thomas 1878: 118) = *Acrobates pygmaeus*. In many Aboriginal languages one species may have a number of names. In **Woiwurru**, if the writer's interpretation of Bunce's 'Bat-mouse' is correct, there could have been at least three names for *Acrobates pygmaeus*.

(b) Howitt uses the English term 'Brush-tailed Phascogale' to identify **Tadjeri**, not **'Tuan'**. Furthermore, where he mentions 'the brushtail, and the flying mouse' in a discussion of food prohibitions for Gippsland **Jeraeil** initiation novices, he identifies the *former* species (in a footnote) as *'Phascogale penicillata'* (Howitt 1904: 633). In another footnote concerning the Wimmera local-group **Doenbauraket** he states **'Doen** is probably the same as **tuan** the small "flying 'possum."' (Howitt 1904: 55). Howitt clearly did not begin the use of **Tuan** for *Phascogale tapoatafa* as suggested by Conole (1988). Where he uses **Tuan** as a gloss for the **Ngarragu (Ngarigo) Mandarung**, we must assume he means *Acrobates pygmaeus*, consistent with his usage in 'Notes on the Kurnai Tribe' (Howitt 1880).

Conclusion

The myth of Koo-borr elaborates mythic connections between three arboreal marsupials according to Upper Yarra **Woiwurru** tradition. However the identity of the squirrel brothers, **Koob-borr's** antagonists, rests on Howitt's identification and cannot be confirmed. One point is certain – 'Howitt's **Tuan**' was not *Phascogale tapoatafa*.

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from inside front cover

GROUP EXCURSIONS

All FNCV members and visitors are invited to attend any Group Excursions.

Botany Group – Fourth Saturday

Saturday, 24th February. Lake Mountain.

Fauna Survey Group

Saturday, 10th – Sunday, 11th December. Water rats at Werribee.
Monday, 26th December – Monday, 2nd January. Ned's Corner, Mallee.
Saturday, 28th – Monday, 30th January. Bamganie State Forest.
Saturday, 11th February. Leadbeaters Possum. Upper Yarra.
Saturday, 18th – Sunday, 19th February. Water Rats at Werribee.

HAWTHORN JUNIOR FIELD NATURALISTS CLUB

Excursions

Saturday, 3rd – Sunday, 4th December. Little Desert.

Australian Natural History Medallion 1988

The 1988 Australian Natural History Medallion has been awarded to John Dell, a biologist in the Department of Biogeography and Ecology at the Western Australian Museum. He has a wide interest in natural history, particularly in herpetology, ornithology, biogeography and conservation.

As a conservationist John Dell's achievements have been outstanding. In a professional capacity he has conducted two biological surveys: of the Western Australian wheatbelt, to document the vertebrate species still present and to record their distribution and abundance in the area; and of the Eastern Goldfields region to study plant and animal communities, and their conservation needs. This is a region of great scientific interest and importance, where there is increasing pressure from agriculturalists to have the southern parts released for cereal crop production. John Dell has also conducted expeditions to the Mitchell Plateau in the remote north-west of the Kimberleys. The results of these surveys have appeared in the **Records of the Western Australian Museum**, and have brought international recognition of his work in faunal surveys, resulting in a reassessment of criteria for establishment of conservation reserves, with consequent long-term benefits for wildlife conservation.

As a member of the Western Australian Naturalists' Club John Dell contributed to their study of the Wongan Hills in the wheatbelt, which led ultimately to the area being added to the Register of the National Estate. He has also assisted the Club with submissions to the Western Australian government on such topics as the value of wetlands and the jarrah forest.

John Dell has been a member of the Western Australian Naturalists' Club since 1962, has held all the executive offices, including being President twice, and is currently Vice-President and a member of the editorial committee of the **Western Australian Naturalist.** During his first term as President of the Club, with the aid of a grant from the Federal Schools Commission, set up Western Australia's first Field Study Centre at Tomato Lake, which was later handed over to the W.A. Education Department to provide natural history education for local primary and secondary schools. Another field station was completed at Culeenup Island during John Dell's second term as President.

He has been most active in Club affairs, particularly in organising wildlife shows, and the annual photographic competition. His own photographs have appeared in a number of scientific and educational publications. He co-ordinated the mammal section of the flora and fauna study of the Darling Scarp, which was reported in the **Western Australian Naturalist** v.17 pt.4 July 1988.

His community involvement is reflected in the range of organisations to which he has lectured, from schools and clubs to special interest centres and retirement villages. He has also broadcast on radio and appeared on television to comment on conservation issues.

In 1985 John Dell was invited by Academia Sinica to visit China. He studied small mammal physiology at the Kunming Institute of Zoology, and lectured there and at the Shannxi Provincial Museum in Xian on faunal conservation in Australia, as well as visiting the Beijing Natural History Museum to discuss conservation matters.

In his particular field of herpetology John Dell is studying the reproductive strategies of Western Australian reptiles, and the comparative biology of reptiles remaining in the fragments of privately-owned land in the wheatbelt. In the course of his studies

he has discovered a number of new species, including the gecko *Gehyra purascens*, the skink lizards *Morethia obscura, Lerista xanthura* and *Ctenotus xenopleura*, as well as a number of new insects and spiders. The rare skink lizard *Ctenotus delli* was named in his honour.

John Dell was nominated for the Medallion by the Western Australian Naturalist's Club. He lives in Kalamunda, and is married with three sons.

Sheila Houghton

Nomenclatural Notes on Two Frogs from South-Eastern Australia

By G. M. Shea*

Pseudophryne dendyi Lucas, 1892 was described from a single specimen, now lost (Coventry, 1970), from the Wellington River in north Gippsland. The taxonomic status of this species is unclear (Moore, 1961, Barker & Grigg, 1977, Cogger, 1986). In view of this uncertainty and the lack of type material, it is worth drawing attention to an account of the collection of the holotype by Howitt, Lucas & Dendy (1891). In a narrative of their expedition to Lake Nigothoruk (now Lake Tali Karng) and Mt. Wellington, they note that a single specimen of "a new handsome black and yellow frog" was collected on 26 December 1890, from under a log along the river edge, near their campsite on a grassy flat "near the junction of the two branches of the upper Wellington [River]". From the description of their route, this site appears to be at grid reference 469370 on map SJ 55-6 Warburton (Australian 1:250 000 topographic map series), in approximately 37°32'S 146°43'E, just downstream of the junction of the Carey and Wellington Rivers. At this locality, "the river flows from side to side of a broad, flat-bottomed valley, bordered by moderately steep grassy slopes. The level land is thickly timbered with *Eucalyptus amygdalina, E. viminalis* (mountain variety) and is probably flooded at times." It is stated "the frog will be described elsewhere, by Mr. Lucas, as *Limnodynastes nigro-lutea*". Lucas apparently subsequently changed his mind, for this specimen, the only frog apart from *Litoria lesueurii* collected during the expedition, is clearly the holotype of *Pseudophryne dendyi.* The name *Limnodynastes nigro-lutea* Hewitt, Lucas & Dendy, 1891 is a *nomen nudum* (unless "handsome black and yellow frog" be counted as sufficient description), and appears only there and in a list of exhibits accompanying the presentation of the paper at a Field Naturalists' Club of Victoria meeting (Anon, 1891).

Three other names are proposed by Howitt *et al.* (1891): the galaxiid fish *Galaxias nigothoruk,* the crayfish *Astacopsis serratus* var. *wellingtonensis,* and the planarian *Geoplana howitti.* The latter two names as published by Howitt *et al.* (1891) and listed by Anon (1891) are *nomina nuda,* although *G. howitti* was formally described by Dendy (1891). A brief description accompanies the name *Galaxias nigothoruk,* subsequently formally described by Lucas (1892b). Anon (1891) lists this species as *Galaxias lacustris,* another *nomen nudum.*

Litoria burrowsi Scott, 1942, the only endemic Tasmanian hylid frog, was named for Miss M. Burrows, collector of the type series, by Scott (1942) (see also Hewer, 1965; Martin & Littlejohn, 1982). Under Articles 31(a)(ii) and 32(c-d) of the Code of Zoological Nomenclature, the specific epithet is therefore emended to the feminine form as *burrowsae.* Tyler & Lungershausen (1986) erroneously state that *Litora spenceri* Dubois, 1984 is a replacement name for *L. burrowsae.* Rather, *L. spenceri* is a replacement name for *L. maculata* Spencer, 1901. The species referred to as *L. spenceri* by Tyler & Lungershausen (1986) is *L. burrowsae* (M. Tyler, *in litt.*).

Acknowledgments

I thank H. Cogger and M. Tyler for their useful comments on the manuscript.

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Gordon William Beaton (1911 – 1988): An amateur mycologist with an international reputation.

Gordon Beaton was born in Lismore, western Victoria, near to where his father managed a sheep station, and Gordon attended the Noorat School. He worked first in Terang, then in a partnership at Cobden. Finally, in 1960, he established his own firm, Beaton & Son – an automotive engineering business which also serviced agricultural machinery, in Camperdown. He married Katrine in 1935, and is survived by his wife, two sons and four grandchildren. Gordon was a prominent rifle shot who was selected three times for the Victorian team. He won the grand championship in 1949 and was second in The King's Prize. He had also excelled at cricket, bowls and billiards.

While engaged in rifle shooting he made friends with the late Herbert T. Reeves, a naturalist, photographer and illustrator. Herb. specialised in hand colouring black and white photographs of flowers, and his excellent illustrations are to be found in books by Thistle Harris and in E.E. Lord's **Shrubs and Trees for Australian Gardens.** Gordon and Katrine ventured into photography too, but Gordon found the flowers to be rather frustrating because they would not stay quite still, so he turned his attention to fungi, particularly the small cup-fungi that he observed growing along bush tracks. He needed to name his finds, so he sought help from Dr Ethel McLennan, Associate Professor of Botany at the University of Melbourne, and from Dr Jim Willis, Assistant Government Botanist at the National Herbarium. Many of these fungi were known only at the generic level, the species being still undetermined and often undescribed. It had been assumed that species were generally much the same as similar forms overseas. Microscopic study was needed to name them accurately. Dr McLennan had suggested that Gordon contact Dr Dennis, chief mycologist at Kew Herbarium, England. Gordon purchased a good modern microscope which he kept in perfect order, available texts and, with advice from Dr Dennis, began to study these small Discomycetes. This became his major interest when, at 62 years he and Katrine retired to live at Eildon. For a while Gordon sent his specimens, microscope slide-preparations and descriptions to Kew, England, for others to publish. Recently (1987) B.M. Spooner's text has been published for Australasian species; it was largely based on Gordon's collections.

In 1975 I began to help Gordon publish his own work - although he continued to send to Kew collections of those fungi which belonged to large groups and whose identification was beyond his ken. Gordon collected, prepared and identified his own material, made the drawings and wrote the diagnoses and descriptions. On this basis I organised the paper and had the diagnoses translated into Latin, usually by George Scott (then on the staff of Monash School of Botany). I gathered the references and wrote up the paper. Nearly all were published in the **Transactions of the British Mycological Society**, but some appeared in the **Victorian Naturalist**.

Overseas mycologists, such as Dr Sheila Francis, and Dr Brian Sutton from the Commonwealth Mycological Institute (Kew, England), Dr Derek Reid and Dr David Pegler from The Herbarium, Kew, came to visit and assist. Gordon then began working on the subterranean Gasteromycetes. In 1983, after the 4th International Congress on Plant Pathology was held in Melbourne, I drove David Pegler to visit Gordon and from this association came the final major papers on this group (nine contributions to **Kew Bulletin**).

His latest projects involved identification of the fungal component in the diet of an endangered species of potaroo with The Rylah Institute, and of a betong with Dr Taylor in Tasmania. He died rather suddenly on 2 April 1988.

Gordon was a keen member of the Field Naturalists Club of Victoria, and often talked to fellow members of his findings. His work was respected in England, America, New Zealand, Argentina and in all countries where these small fungi were studied. He had an international correspondence. David Pegler regarded him as "one of the most outstanding mycologists in Australia" and wrote that "an item will shortly appear in **The Mycologist**".

The thirty eight fungal papers by Gordon Beaton (1976–86) – all but the first in collaboration with other mycologists – are set out chronologically by G.A. Crichton in the **Victorian Naturalist 105**(4): 90-91 (July/Aug. 1988). In these writings 41 species of fungi are described as new.

Several mistakes and omissions on page 91 of Crichton's bibliography call for correction, viz:

In first column

Line 20, "**Pyronomycetes**" should read Pyrenomycetes and appear in Roman type (not Italics).

Line 8 from bottom of page, "Smart, J." should read Swart, H.J.

In second column

Line 3, the "s" in Saxicola should be lower case.

Line 24, before "**Kew Bulletin**" insert 3. Cortinariales, and for "39(4)" read 40(1).

Line 31, before "**Kew Bulletin**" insert Boletales, Agaricales, Aphyllophorales.

Line 7 from bottom of page, "Labyrinthomyces" should be italicized.

Grètna Weste,
Botany School,
University of Melbourne.

Club News: Who's Doing What?

Michael McBain, Julian Grusovin and Ron Pearson attended the Land Conservation Council seminar 'Understanding and Investigating Wilderness' in October.

Norm Stanford represented the Club at the launching of the State government's Open Space Plan for Melbourne at the Wattle Park Chalet on 13 Sept. 1988.

The State government has announced the allocation of $100,000 to develop a management strategy for Westernport Bay. Ailsa Swan, who has been involved with the conservation of the area for the last ten years, primarily as a bird observer, would like to hear from any member with an interest in other aspects of the ecology of Westernport, in order to provide input to this strategy. Write to Mrs Ailsa Swan, 153 Canning Street, Carlton 3053.

It is estimated that there are about 100 foxes in the Melbourne metropolitan area. Our President can vouch for one in the vicinity of the Astronomer's Residence: it bit him.

Any items for this column will be gratefully received. Let us know what you are doing. (Address: 30 Golf Links Crescent, Dingley 3172).

Sheila Houghton

Letter: Kangaroos in Hattah-Kulkyne National Park

Dear Sir,

In the Victorian Naturalist Vol. 105 (6) Coulson (1988) discussed the population history of Western Grey Kangaroos in Hattah-Kulkyne National Park and elsewhere in north-western Victoria. In that article he referred to an earlier account of the park rehabilitation and vegetation regeneration program i.e. Cheal (1986). Coulson (*op. cit.*) stated that the earlier diaries of Krefft had been misinterpreted by Cheal (*op. cit.*) and appeared to assume that post-settlement increases in kangaroo numbers provided the justification for reduction of the kangaroo population. Neither proposition is correct.

Nowhere in Cheal (1986) have the impressions of any of the early observers been used to infer the early kangaroo population density or levels in Hattah-Kulkyne. As Coulson (*op. cit.*) later writes ". . . the published historical data are equivocal". The early observations are just too imprecise to determine the early population levels.

Cheal (*op. cit.*) did refer to a marked increase in abundance of the larger kangaroos in Hattah-Kulkyne National Park, but that statement was based on the increases observed since the earliest reliable quantitative surveys, as discussed more fully by Coulson (*op. cit.*). Indeed, the latter author referred to the increase in kangaroo numbers documented since recovery from the 1982-83 drought and yet elsewhere in his article stated that ". . . there is no conclusive evidence for any change in the kangaroo population at Hattah-Kulkyne since European settlement"!

Nevertheless, these are minor differences of emphasis. The primary rationale for the park rehabilitation program in Hattah-Kulkyne National Park (including grazing pressure control) is the observed (and measured) vegetation and habitat degradation. This degradation is continuing.

The kangaroo cull referred to by Cheal (1986) was restricted to the Mournpall Paddock (and management block) – approximately 12% of the area of the park. That cull had been (reluctantly) proposed and supported by those biologists, managers and field naturalists with long standing familiarity with the park and its problems. The cull attracted some adverse criticism from some animal welfare groups and their supporters. Following that reaction, future planned control of kangaroo grazing pressure did not take place. As a consequence, kangaroos rapidly increased in numbers (particularly in the Mournpall Paddock, where rabbit control has been notably effective) to reach population levels higher than before the cull. Vegetation degradation is thus continuing. Pine-Buloke Woodlands are particularly threatened (less than 1% of these woodlands are regenerating state-wide; Blakers and Macmillan, 1988). Rare and threatened plants are still being eliminated. For example, *Psoralea tenax* (Tough Psoralea – considered 'endangered' by Gullan et al., 1988) and *Swainsona phacoides* (Dwarf Swainson-pea – 'vulnerable' in Gullan *et al., op. cit.*) have both recently been eliminated from the park. The latter may now be extinct in Victoria.

David Cheal

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Blakers, M. & Macmillan, L. (1988) *Mallee Conservation in Victoria.* Research Paper No. 6, RMIT Faculty of Environmental Design and Construction. Melbourne.

Cheal, D. (1986) A park with a kangaroo problem. *Oryx* 20, 95-99.

Coulson, G. (1988) The History of Kangaroo Populations in Hattah-Kulkyne National Park, North-western Victoria. *Victorian Nat.* 105, 68-73.

Gullan, P.K, Cheal, D.C. & Walsh, N.G. (1988, in prep.) *Rare or Threatened Plants in Victoria.* Pub. Dept. Cons., Forests & Lands, Melbourne.

Report of the Conservation Co-ordinator; May 1987 to August 1988

Submissions and comment to government:
- Flora and fauna guarantee legislation.
- Alpine Area planning proposals.
- Draft profile of Orbost Region.
- Conservation of Long-forest Mallee.
- Mallee Study Area Review.
- Mining in reserves.
- Mineral exploration leases in Tingaringy National Park.
- Very Fast Train project.

Other correspondence and activities:
- Information to Stephenie Rennick on fauna of Greens Bush.
- Information to Orbost District Environment Group on contacts in local Field Naturalists Clubs.
- Information to FNCV Group Secretaries on grants to environment groups.
- Information to VNPA on contacts in FNC's re linear parkland on disused railway land.
- Prepared profiles on people nominated by FNCV for Conservation Advisory Committee.
- Letter to Ina Watson thanking her for donated slide collection.
- Co-ordinator of FNCV involvement in book "Marine Life Diving Guide", being published by the club.
- Attended seminar on proposed pulp mill at Orbost, held at Lakes Entrance.
- Represented the Club at launching of the Draft Management Plan for Warrandyte State Park.

Problems and areas of concern:
- Need for assistance with typing.
- Lack of FNCV policy guidelines on conservation issues.
- Need for involvement from a wider range of the membership, especially country members, to broaden the range of issues tackled and to improve the standard of submissions.

Objectives worth attention:
- Improve dissemination of information at meetings.
- Encourage broad input on conservation issues by members, including those in the country.
- Begin preparation of FNCV Policy Statements on conservation issues, such as duck-hunting, kangaroo harvesting, mining, rare species management, woodchipping, fire management and urban parks and wildlife.
- Forthcoming major issues:
  - LCC Proposed Recommendations on the Mallee.
  - LCC Review of Melbourne (East) Study Area.
  - Woodchipping and a pulpmill in East Gippsland.
  - The Very Fast Train.
  - The Review of the Mines Act.

I regret that I must resign from the position of Conservation Co-ordinator, but a job transfer to Orbost has made this necessary. In particular I seem to be leaving many things unfinished. I look forward, however, to being the first country member of the Conservation Committee. I believe Graeme Gillespie will fill the position at least as competently as I have been able to.

Stephen Henry

Field Naturalists Club of Victoria
Club Activities

General meeting 8 August 1988

Honorary membership was conferred on Ian (Dick) Morrison in recognition of his forty years' membership of the Club, and he then gave a talk on 'Orchids of Victoria'. Dick Morrison's interest in orchids began about thirty years ago, and he started photographing them on a Club trip to the Grampians in 1960. 19 orchids were photographed on that occasion, and Mr A.J. Swaby commented that he had a long way to go yet. Dick Morrison has gone a long way, hunting orchids in all parts of Victoria, and he now has about 143 species on film, a selection of which he used to illustrate his talk.

Exhibits: Selection of slides from Paul Genery's collection: foraminifera from the Red

Roy Wheeler

We regret to announce the death of Roy Wheeler on 25 Sept. 1988. An obituary notice will appear in a later issue.

Sea; sections of Sea Urchin spines; foraminifera, showing clumps of sand grains cemented together by the animal, giving the appearance of shells; Bryozoa or Polyzoa *(Catenicella)*: under microscopes. (Dan McInnes)

Andy Blackburn had noticed a growing number of native birds in Essendon, including wattle birds, galahs, cockatoos and a pied currawong. Hilary Weathered had seen *Brunonia australis* in flower in the middle of July, unusually early. The President drew members' attention to a newpaper article on the expedition to the King Leopold and Napier Ranges of the Kimberleys, W.A. in which Dr George Scott was reported to have found a missing link: a plant between mosses and liverworts; 600 fungi had also been found on this expedition where only 30 had previously been recorded.

General meeting 12 September 1988

This was Members' Night. Sibely May gave a talk on 'Weeds'. She has been studying the incidence of weeds in a small area of bushland on the south side of North Blackburn Square shopping centre. A succession of building operations over the years has threatened the area, together with pedestrian use and the dumping of garden refuse. To date 59 species of weeds have been identified, and efforts have been made to eradicate these, thereby encouraging the regrowth of indigenous species. Sibely and an interested group have involved local schools and residents in an educational programme, and encouraging progress has been made in preserving this area over the last few years.

Sheila Houghton showed a selection of slides from the 1950s and 60s, donated to the Club by Ina Watson, the first woman President of the Club (1947-48) and Editor of the **Victorian Naturalist** (1951-52).

Stephen Henry showed slides of possums and gliders taken during his studies in East Gippsland.

The Fauna Survey Group is conducting a survey of water rats at the MMBW Werribee farm, and Julian Grusovin showed some slides of the animals.

The President drew attention to an article in *The Age* of 2 Sept 1988 reporting the proclamation of *Acacia pycnantha* as Australia's floral emblem. Dr John Fox of W.A. was quoted as saying that *A. aneura* had a greater claim to be the national emblem, since it had a wider distribution. A letter from the Club was published on 10 Sept in which some apparent confusion over botanical species was cleared up, and the choice of *A. pycnantha* supported.

The President also mentioned several other items: the suggestion that the Club consider officially sponsoring a member to attend conferences such as the recent International Organization of Paleobotany Conference, in relevant areas of interest; whether the Club should award a medallion to private enterprise for their protection of the environment where applicable, and the effects of the Very Fast Train. The latter topic produced considerable discussion.

Exhibits: A selection of rock sections under microscopes: Dacite: quartz, feldspar with fine groundmass of crystals; Limburgite: iddingsite (altered olivine), fine black magnetite; Marble: calcite showing cleavage lines; Solsbergite: orthoclase feldspar with fine groundmass; Basalt; olivine with lath-like feldspar crystals; Granite: quartz (clear colour crystals), feldspar with parallel lines which are the twinning planes, biotite is yellow; Limestone: fossil forminifera showing structure from Batesford quarry; Diorite: hornblende large crystals showing alteration cleavage lines. (Dan McInnes) Selection of weeds from North Blackburn Square bushland area. (Sibley May)

Field Naturalists Club of Victoria

In which is incorporated the Microscopical Society of Victoria

Established 1880

Registered Office: FNCV, c/- National Herbarium, Birdwood Avenue, South Yarra, 3141.

OBJECTS: To stimulate interest in natural history and to preserve and protect Australian fauna and flora.
Members include beginners as well as experienced naturalists.

Patron

His Excellency, The Rev Dr John Davis McCaughey, The Governor of Victoria.

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The Victorian Naturalist

The Magazine of the

FIELD NATURALISTS CLUB OF VICTORIA

Volume 104, 1987

COMPILED BY K. N. BELL